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ELECTRICAL WORLD

November 19, 1932

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Photo Courtesy The American Brass Co.

Electrified Union Terminal at Cleveland. It is reported that the New York-Washington division of the Pennsylvania Railroad will be ready for fully electrified operation by February, 1933.

FEATURES OF THIS ISSUE:

Residence Load Characteristics

Sifting Power Prospects

Probable Applications of Gaseous Tubes

Power Station Cost Control

The figures given below which prove the permanency of sub-surface treated ground electrodes cannot help from being of tremendous interest to every transmission and distribution engineer.

The Murray Hollow Copper Ground Electrode is distinctive in that it alone provides for regulating ground resistance through sub-surface treatment of the soil.

By sub-surface treatment we mean the imbedding of electrolytes the depth of the electrode—at the permanent moisture level.

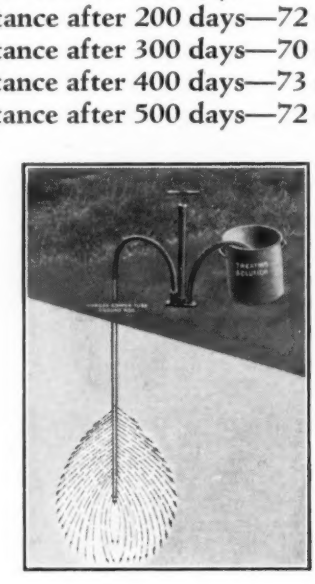
This means that the electrolyte is imbedded where precipitation and seasonal soil moisture variation will but slightly affect it. The solution is where it will give prompt results, where it will last the longest and do the most good.

As proof that initial resistances can be permanently reduced by sub-surface treatment to from 25% to 35% of their original values, we place the following figures before you.

Initial Untreated Resistance — 195 Ohms
5/8" x 10' Murray Hollow Copper Ground Electrode

Resistance after copper sulphate treatment—60 ohms
Resistance after 100 days—70 ohms
Resistance after 200 days—72 ohms
Resistance after 300 days—70 ohms
Resistance after 400 days—73 ohms
Resistance after 500 days—72 ohms

It is imperative that ground resistances should be periodically tested. No ground can be considered adequate until tested. Soil resistances vary to such an extent that identical ground electrodes separated only a few yards are liable to have a noticeable difference in resistance.



The problem of obtaining desired resistances in an easy and economical way has been solved by Murray Hollow Copper Ground Electrodes.

A test installation, particularly where high ground resistance has been encountered, will prove the efficacy of the Murray Hollow Copper Ground Electrode. Charts, booklet and price sheet sent on request.

METROPOLITAN
DEVICE CORPORATION
1250 ATLANTIC AVENUE
BROOKLYN NEW YORK
SINCE 1899

ELECTRICAL WORLD

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November 19, 1932

Opposition Slows Progress of Pennsylvania Inquiry

Failure to secure co-operation from certain commissioners led to a request that subpœnas be issued for the banking and brokerage accounts of present and former members of the Pennsylvania Public Service Commission by Oliver K. Eaton, chief counsel for the state Senate investigating committee, at the hearing held last week. The committee took the request under advisement and at the conclusion of a brief executive session Chairman William S. Rial announced that a decision would be made later when the full membership was present. In making the request Mr. Eaton stated that form letters asking for details of their bank accounts and brokerage transactions had been sent to former and present commissioners, but that satisfactory replies had not been received from some. Mr. Eaton also requested power to subpœna other individuals and records pertaining to the investigation.

Several hours were devoted to the examination of A. B. Millar, executive director of the Pennsylvania Electric Association, who, under questioning by Mr. Eaton, admitted that his testimony last year before the Senate's inquiry into public utilities, to the effect that there had been no prearrangement in a trip he made to Europe in 1927 with the late W. D. B. Ainey, to be incorrect. The trip was financed by officials of the Philadelphia Rapid Transit Company, he said, but had nothing to do with any rate case the company may have had pending before the commission. According to the witness Mr. Ainey had repaid him in cash while they were at sea. He identified his indorsement on P.R.T. checks, aggregating $95,000, but was unable to recall where the funds went. He signed the checks in 1923, when he was associated with the late Thomas E. Mitten, head of the transit company. Appearing before the Rial committee primarily to explain the past activities of the electric association's public relations committee, headed by Alexander Gaddess, Mr. Millar testified that the association had spent $49,000 for "unlooked-for expenses" during the 1931 Legislature and that the money had come from member companies.

M. A. Miller, secretary-treasurer of the Penn Central Light & Power Company, testified that the financial policies of the Penn Central were directed from the New York offices of Insull holding companies. The witness said he was unfamiliar with the details of a $5,500,000 Penn Central bond issue, which Mr. Eaton had charged the company had floated after the Public Service Commission had forbidden it. The attorney asserted Penn Central had sold the bonds to National Electric Power in return for Penn Central stock.

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The cost of the electrical method of transmitting energy under modern conditions is very nearly the same as the cost of carrying the coal which produced the energy. If present developments fulfill their promise, electrical transmission of energy will be substantially cheaper than carrying coal.

E. W. MARCHANT,
President
Institution of Electrical Engineers.

[**In his inaugural address before the British society of electrical engineers Professor Marchant paid high tribute to the potentialities of direct-current transmission using electron tubes as converters.**]

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Better Highway Lighting Offered as Safety Factor

Based upon further surveys of the relation between lighting and accidents in which motor vehicles are involved (ELECTRICAL WORLD, July 9, page 33), R. E. Simpson, illuminating engineer Travelers Insurance Company, told the illumination group of the New York section of the A.I.E.E. this week that "the percentage of night accidents is nearly four times greater than is warranted by the traffic alone."

"The most practical and effective remedial measure," concludes Mr. Simpson, "consists in increasing visibility, either by making radical improvements in headlights or by providing adequate street lighting, or both."

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Insull Marks Birthday; Middle West Report Out

Deluged with messages and floral gifts, Samuel Insull celebrated his 73d birthday in the small hospital room in Athens to which Greek official action has confined him. There was a birthday cake too and a long line of varied-interest visitors. Physicians report the former utility executive to be in a nervous and depressed state.

"We do not know whether he is guilty or not," Premier Tsaldaris has stated. "The only thing to do now is to leave the matter of extradition to Greek justice on the basis of the Greek treaty with America. For the time being Greece is responsible for him. Since he is ill, we ordered his transfer to a hospital. He will be well guarded."

Meanwhile the two assistant state's attorneys en route from Chicago to effect extradition are cautiously laying plans to avoid any legal flaws in their actions. They have arrived in Italy and awaited a ship of American registry to bear them to Greece.

Swanson loses in election

Activities originating with the state's attorney's office in Chicago to push other phases of the Insull case will probably lag somewhat for a while. State Attorney Swanson lost out in the election day crisis and relinquishes his duties to Thomas J. Courtney on December 5 for

conclusion. Mr. Swanson states, however, that extradition proceedings will be pushed in the meantime under the existing charges of embezzlement and larceny.

Samuel Insull, Jr., has returned, declining, in answer to all inquiries to discuss the subject, with the statement that: "I never impede or facilitate the business of the press." He faced a searching five-hour examination by attorneys for Insull Utility Investments, Inc., on his return to Chicago at a bankruptcy hearing.

Middle West Report

Holders of the $40,000,000 issue of serial notes of the Middle West Utilities Company have been advised by a noteholders' committee that there are prospects for their receiving about 37 cents on the dollar. This report offers a higher recovery than a previous one and is predicated upon the assumption of immediate liquidation of the organization to realize upon today's security market prices.

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St. Lawrence Pact Opposed at Senate Group Hearing

Ratification of the St. Lawrence waterways treaty negotiated last summer between the United States and Canada was opposed by New York waterways officials and the Association of Railway Executives when a Senate foreign relations subcommittee opened hearings at the Capitol on November 14. The principal points made were that the project has not been adequately studied and that ratification of the treaty at this session would be premature; that the cost would greatly exceed the estimate; that structures built with American money would become Canadian property; that probable benefits have been exaggerated, and that it would add a large amount to the national tax burden.

E. P. Goodrich, consulting engineer for the Albany Port District Commission, was authority for the statement that steam power can be generated and distributed throughout New York and New England more cheaply than can the power to be developed in the St. Lawrence River. He estimates that it would take twenty years to absorb the power that will be brought in.

Peter G. Ten Eyck, president of the New York State Waterways Association, made the point that when a large project is built with money raised by taxation it should benefit the producer and consumer alike, as both are required to pay for it alike. Mr. Ten Eyck told the committee that all of the technical studies that have been made are inadequate in their dealing with numerous navigation questions, and savings that could be effected by shipping through the new waterway. He takes exception to the failure of any one to estimate the price that consumers would have to pay for St. Lawrence power and the transmission losses that might be expected at different points.

Alfred P. Thom, general counsel for the Association of Railway Executives, objected to the establishment of a subsidized service to compete with rail carriers. The tonnage diverted, he told the committee, would result in unjustifiable injury to the railroads. Hearings on the treaty must be completed by December 1.

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Court Fines Town for Failure to Keep Lighting Contract

City officials of Campbell, Mo., and Fairbanks, Morse & Company were held in civil contempt of the United States District Court by Federal Judge Faris in a recent case because the city continued to operate a municipal light and power plant after the court had issued an injunction against the project. The case had been brought into court by the Arkansas-Missouri Power Company, which has a franchise to operate a light and power plant in Campbell. This grant does not expire until 1935. As a punishment for their contempt the court had directed the defendants to pay to the complaining power company all profits of the municipal light and power plant, which started operations in 1930, and in addition to pay all of the costs of the litigation and attorney fees.

Arkansas-Missouri Power Company had charged that the plan under which the city bought the power plant and equipment from Fairbanks, Morse & Company was in violation of the constitutional limitation on the city's authority to incur debt. The city had voted a bond issue of $20,000 to pay for a distribution system and provision was made under which earnings of the plant were to be set aside to retire these bonds and pay off a debt of $40,000 to Fairbanks, Morse & Company. The city ordinance specified that the $40,000 debt was not to be a general obligation of the municipality, but the court held that the taking of all of the earnings of the power plant to pay it made it a general debt and in excess of the constitutional limitations. This ruling of the District Court was upheld by the

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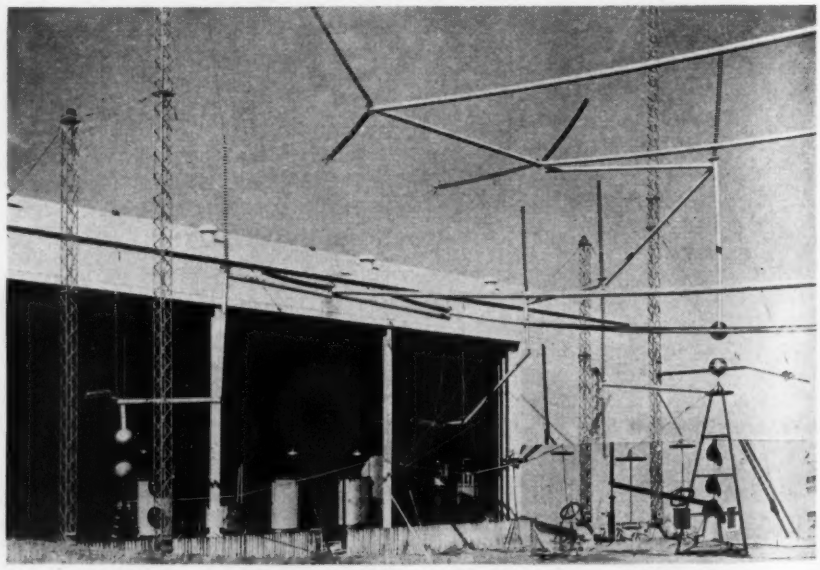
3,000,000-Volt Lightning Generator



Lightning studies, preparatory to designing insulation and structures for the transmission lines from Hoover Dam to Los Angeles, will be made with a new lightning generator, rated among the largest in the world, which has recently been installed at the Ryan laboratory of Stanford University. This generator will produce a 3,000,000-volt surge having 20,000 watt-sec. of energy.

An unusual and original design has been employed in constructing the generator. Four sheet-metal tubes, each 11¼ in. in diameter and 1,050 ft. long, have been suspended outdoors on conductors of conventional size. The upper pair of tubes acts as one plate of a condenser, the other plate being formed by the lower pair. Horizontal spacing of the upper pair is 30 ft., that of the lower pair being 40 ft., vertical spacing between plates being 30 ft. Spacing to ground from the lower tubes is 45 ft. at the supports.

The top plate of the condenser is charged to a crest voltage of 1,500 kv. positive, the bottom plate being charged to the same value negatively. Under this condition the capacity of the condenser is 4,300 micro-mfd.

United States Circuit Court of Appeals on January 8, last.

After this decision the contract between the city and Fairbanks, Morse & Company was revised, but Judge Faris held that the new arrangement did not cure the violation of the constitutional limitation. In his earlier ruling Judge Faris had issued an injunction, which he now holds was violated. The city plans to appeal from the ruling of Judge Faris and if necessary to carry the case to the U. S. Supreme Court.

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Utility Aid for State to Be Sought in Oregon

Upon recommendation of the State Budget Director, public utilities operating in Oregon will be asked to contribute approximately $107,000 annually in the form of additional fees to enable the Utilities Commission, Hydro-Electric Commission and the Department of Engineering to function upon a self-sustaining basis. The movement is being designed by the Budget Director as a tax reduction measure under the provisions of which the necessity for making legislative appropriations for the support of the three offices will be eliminated.

In addition to the total amount of funds collected in yearly fees at present, the regulatory department will require $27,000 and the Hydro-Electric Commission and State Engineer will ask for $50,000 to be represented in increased fees. The director, in offering his recommendation, asserts that under his plan for self-supporting regulatory offices the taxpayer will be relieved of the necessity of paying the entire expense of conducting the departments by the non-taxpayer being required to meet some of the costs in the nature of increased service charges which will reflect from the advanced fee schedules.

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Merchandising Committee to Assist Distributors

New activities designed to aid the retail distributor to be a more effective and constructive factor in the merchandising of electrical appliances will be inaugurated by the Electrical Merchandising Joint Committee, according to a recent statement made by D. F. Kelly, chairman. In addition to providing the distributors with a merchandising manual, the committee is launching an analysis of manufacturer-dealer relations with the hope of improving trade relations among manufacturers, wholesalers and retailers and at the same time of making for a more efficient and economic distribution. A committee, composed of Lew Hahn, chairman; Harry F. Cappel, R. J. Atkinson and J. F. Owens, is working with the executive secretary, Dr. Kenneth Dameron, in the development of these plans, which came as a result of a recent Electrical Merchandising Joint Committee meeting in Chicago.

At this meeting Mr. Cappel, past-president of the National Retail Furniture Association, presented a review of merchandising problems incident to the distribution of electrical appliances. J. F. Owens, president of the Oklahoma Gas & Electric Company, discussed the merchandising situation in the state of Oklahoma resulting from the law prohibiting utilities to merchandise. Preston S. Millar, president of the Electrical Testing Laboratories, emphasized the need for co-ordinated testing of appliances. J. F. Becker, vice-president of the New York Edison Company, discussed the merchandising plan adopted by his company, and W. R. Putnam of the Electric Bond & Share Company analyzed the important problems concerning the financing of consumers.

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Georgia Power Property Protected from Vandalism

Records of the Georgia Power Company, made public last week, reveal some 30 serious acts of vandalism which have been occurring since March, 1931, resulting in damage to high-tension transmission lines, steel towers, wood poles, substations, transformers and other service equipment. The most serious of these acts from the standpoint of danger to the public and damage to property occurred October 31, when a steel tower in a residential section was destroyed by the explosion of dynamite (ELECTRICAL WORLD, November 12, 1932, page 648).

In spite of this long series of attacks, Atlanta has had no serious interruption to its electric service, due to the vigilance of the company employees and to the thoroughness with which the electric system has been designed. Energy is brought into the city from several different directions and from different sources of supply. In addition, the distribution system has been designed so that service can be supplied from two or more sources in case of damage to any one of them. All of the large primary substations and the smaller secondary substations are connected with each other by two or more lines, making it possible in event of damage to one of the lines to supply the service by switching current over one of the other lines. Safeguards installed to minimize interruptions caused by lightning and other natural causes have served also in this emergency, and automatic relays and oil circuit breakers, cutting the current off in from one-third to one-fifth of a second after a short circuit occurs, have reduced to a minimum the danger to the public from damaged wires. The transmission lines and most important distribution lines are patrolled, the company points out, regularly and thoroughly.

So greatly agitated has the populace become in response to the dynamiting and other acts of vandalism against Georgia Power that the Fulton County grand jury has urged efforts through resolutions adopted by it that concerted action of press, people and police be adopted to bring the criminals to justice.

Watchful Waiting Is Resumed

Unable to make up its collective mind as to immediate future prospects and unwilling to hazard much on the likelihood of either improvement or decline, the speculative community is biding its time until some sign shall appear in the clouded business skies to foretell a change.

Steel output has touched the highest point since March, but it rallied similarly last year and crashed heavily thereafter. Those revered three in the group of business indicators, car loadings, bituminous coal output and energy production, are poor solace just now. The first has slumped for the third successive week, this time by 29,259 cars; the second has shown declines for the two most recent weeks for which figures are available, after rising steadily since June; while the third shows a tendency to augment the weakness indicated last week. The election day holiday of course contributed in part to this.

As was anticipated (October 8, page 483), our friends overseas are bringing their troubles to us for sympathetic reception now that they know definitely who is to be our chief executive for the next four years. War debts are due for a bitter fight between the 100 per centers and those who recognize that upon the resumption of a certain amount of world trade rests the solvency of nations.

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West Point Modernized

With the completion of the reconstruction and modernization of all its utilities at a cost of approximately $1,000,000 from funds made available by the U. S. Government for the relief of unemployment, the U. S. Military Academy at West Point, New York, is now considered one of the best-equipped "electric cities" in the country. The modernization program included changing over from direct current to alternating current of the entire electric power plant and street lighting system and the installation of an underground network.

New Jersey to Investigate Associated Subsidiary

Complete investigation of the affairs of the New Jersey Power & Light Company, subsidiary through Metropolitan Edison of the Associated Gas & Electric system, has been announced by the New Jersey Board of Public Utility Commissioners to begin early in December.

The investigation is said to have been prompted by recent developments in Associated hearings elsewhere wherein both the Federal Power Commission and New York Public Service Commission have criticised certain activities of the top holding company.

The New Jersey board is without authority to investigate Associated Gas & Electric, but can exert jurisdiction over local operating companies, and this it is proceeding to do.

Regulation to Protect Investors Dominates Commissioners' Meeting

RIGHTEOUS public indignation at the looting of operating utilities by unscrupulous holding companies was reflected in a vigorous castigation of certain other holding company practices at the first day's session of the annual convention of the National Association of Railroad and Utilities Commissioners at Hot Springs, Ark., this week. With some degree of unanimity the discussion also emphasized the necessity of sparing regulation from public blame for the market shrinkage of Insull securities from something more than two billion to less than fifty million, the difference exceeding the nation's whole electric bill for a year.

As to the method of preventing these abuses there was somewhat less unanimity. One group of regulators agreed with Commissioner Wells of Massachusetts that the holding company problem has two distinct phases, one the relationship through operating utilities with the consuming public and the other relationship directly with the investing public. This group feels that the bearing of the holding company on the consumer can be met adequately by enlightened state legislation endowing the commissions with adequate powers. As Commissioner Hugh White of Alabama put it, in the absence of such legislation it appears to be necessary at times for the commission to transcend and "leave it to the other fellow to prove that the checks are illegal." The new legislation in Wisconsin and Alabama was pointed to as an exemplification of making local regulation reach the holding company situation.

Federal "blue sky" regulation?

Those who place faith in these new statutes and subscribe to the tenets of Commissioner Lilienthal's recent address to the American Bar Association (ELECTRICAL WORLD, October 29, page 588) characterized the sufficiency of state regulation as founded on comprehensive agreement of the amounts utilities may collect as revenue and the amounts they shall be permitted to disburse as expenses. With that concept established federal regulation of the holding company would be purely of the nature of blue sky legislation to protect the investing public.

A somewhat small group seemed to feel that the function of the holding company and the obstacles it places upon effective state regulation of operating utilities is less sharply differentiated than that. The discussions from this quarter did not, however, establish definitely that line of demarcation between federal and state regulation would avert the specter of federal bureaucracy smothering the still remaining vestiges of state rights as to police power. Their principal proposal was that the federal function would be primarily one of fact finding as to construction and manufacturing costs, costs of advisory services rendered, etc., leaving the affected state commissions to render their decisions in the light of the enlarged fund of knowledge, now frequently withheld.

Income and expenses to be justified

Some commissioners viewed the motive behind such obstructiveness as a positive indication of unconscionable profits. On the whole, however, the discussion tended to indicate that the operating utilities, first by presumptive action on the part of the commissions and later by statutory prescription, are going to be required to justify their outgo at least as fully as they now need to justify their income. Thus will much abuse inflicted on the consuming public by a few of the industry units be made a thing of the past.

The unsolved problem is the protection of the investor and the differentiation of securities regulation and service regulation in the mind of the public, now disposed to be critical of the whole institution of utility enterprise and its regulation by the states.

Commissioner Cuthbertson of Indiana said it was lamentable that those who lost in the Insull collapse should not know or be taught to see that practically all of the Insull operating properties are today comfortably solvent as a direct result of state legislation.

Clarion River Sale Refused Commission Approval

Refusing to recognize the transfer of property and rights of the Clarion River Power Company to the Pennsylvania Electric Company, both members of the Associated Gas & Electric system, the Federal Power Commission has ordered the companies involved to take such action as is necessary to revest the property and rights in the Clarion River Power Company, licensee of the commission. The commission found that "the property of the licensee was sold under a purported foreclosure sale in which the Pennsylvania Electric Corporation, controlling the licensee, forced the transfer of licensee's property under said foreclosure sale to the Pennsylvania Electric Company and furnished the securities as funds for its purchase."

In making public its resolution and order adopted today the Federal Power Commission makes the following comment:

In its action in the matter of the Clarion River Power Company's license, the Federal Power Commission has established an important precedent. It announces that where a holding company, by a foreclosure sale against the property of an operating utility licensed by the commission, procures a transfer of such property to another company likewise under the holding company's control, the Federal Power Commission will refuse to recognize the transfer as an involuntary sale.

This ruling, while of general effect on regulation in the interest of the consuming public, incidentally, should be of far-reaching importance to investors in the junior securities of operating companies who will find in it a protection to whatever values they may own which might otherwise be impaired or destroyed by transfers of the property. In the present instance there is involved an issue of $4,453,000 of preferred stock, and the commission's action results in the restoration of whatever equity that stock may possess. The transfer of the Clarion River Power Company property by the actual holding company from one of its controlled subsidiaries to another illustrates the tremendous influence of holding companies over operating companies in the power industry and supports the Federal Power Commission's contention set out in its recent report that adequate federal regulation of licensed operating companies requires regulation of the holding companies in the shadow of which many of the federal licensees live and move and have their being.

Following the action of the Federal Power Commission, C. E. Travis of Travis, Paxson, Wallace & Philbin, counsel for the Clarion River Power Company, stated that his clients had acted in entire good faith under a construction of the law which in their opinion made it unnecessary for the commission's approval to be obtained. However, in view of the contrary finding of the commission he had advised

Oswald Ryan, general counsel for the Federal Power Commission, that his clients were desirous of complying with the commission's orders.

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Columbia Executive Denies Use of Investment Valuation

Presenting the case of the Columbia Gas & Electric Corporation, E. Reynolds, Jr., vice-president, told the Federal Trade Commission at a recent hearing that in so far as rates paid by the public for gas and electricity sold by the Columbia system are concerned the valuations at which the corporation records its investments in subsidiary companies "has never been introduced, directly or indirectly, by the corporation or any of its subsidiaries in any rate proceeding before a regulatory body or court, as evidence of the value of the property of the operating utility for rate-making purposes." Mr. Reynolds stated that, "furthermore, the value at which such investments are carried on the balance sheet of Columbia Gas has not been used for or been the cause of any attempt to revalue the assets of any subsidiary by appraisal or otherwise, so as to reflect on the books of the subsidiaries concerned an increased valuation of its properties, reflecting or having any relation to the value at which the investment therein is carried on the books of the parent corporation."

"I would like to point out," Mr. Reynolds added, "that the values assigned by the directors of Columbia Gas & Electric Corporation in the opening entries on its balance sheet, being recognition between parties dealing at arm's length with values of the properties for the purpose of acquisition and merger, seem to settle the question of whether there had been appraisals or other so-called write-ups of property values preceding. . . ."

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Oregon Commissioner Seeks Control Over Small Plants

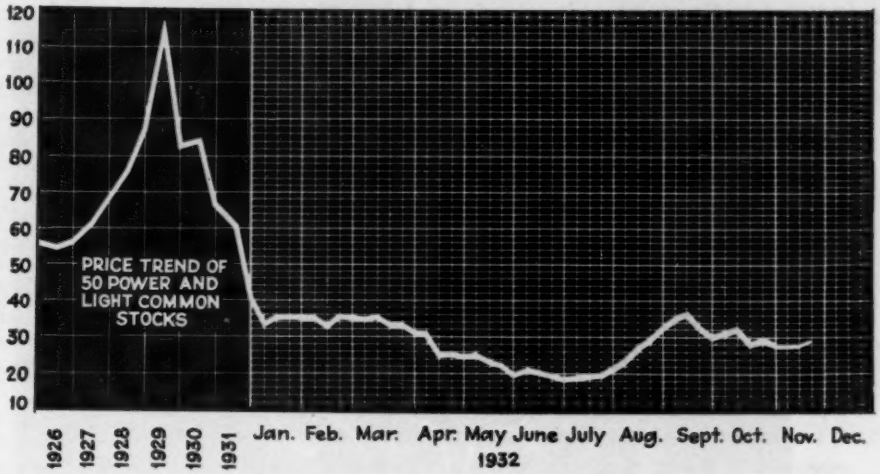
Recommendations that the 1933 Oregon Legislature empower his office to exercise control and supervision over the sales and operations of small, or minor, light and power systems serving limited communities, through the enactment of additional regulatory laws, will be sought by the state Utility Commissioner, Charles M. Thomas.

At the present time he contends the state has no jurisdiction over these small electric systems and in the interests of proper protection to the public the laws should be so extended as to enable his department to lend advice and expert engineering assistance to the people of small communities who contemplate the purchase and operation of generating plants and distributing line equipment. The commissioner determined upon this course after investigation disclosed that Oregon is being flooded allegedly with salesmen and promoters of various types of electrical equipment intended to serve meagerly settled districts or small towns.

Peirce investigation sought

The commissioner has formally instructed a specially appointed prosecutor to appear before the Multnomah County grand jury with evidence and testimony collected by the department to determine whether Albert E. Peirce, president of Albert E. Peirce & Company, violated provisions of the state blue sky act in being a party to transactions involving stocks and bonds issued by the Central Public Service Corporation and the Portland General Electric Company. The documentary evidence, states the commissioner, constitutes grounds upon which to base an investigation, and the specific charges of violating the blue sky act include alleged fraud and deceit in the sale and disposal of the securities in question.

Utility Stocks Move Upward



Though stock prices were somewhat irregular during the past week, advances in light and power issues carried the "Electrical World" index up to 29.7, as compared with 28.7 for the preceding week.

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General Gas & Electric History Told Stockholders

Associated Gas & Electric System has compiled and sent to stockholders a lengthy history of the financial dealings of the General Gas & Electric Corporation since the acquisition of the latter by the former in 1929. The letter reveals the details of how financing was carried on by General Gas & Electric and the processes of the exchanges and switches of securities in the portfolio, especially those of the Associated or its subsidiaries or affiliates. In most cases, it is asserted, the change was made to increase the income available for stockholders of General Gas & Electric.

The history was prepared following the suggestion of some General Gas & Electric shareholders and the New York Stock Exchange. The letter concludes in part with this statement:

"It has been suggested that General Gas & Electric Corporation itself acquired securities of Associated Gas & Electric Company which had been previously offered to stockholders of General Gas and had been rejected by them. . . . The fact is, however, that these acquisitions of similar securities by General Gas & Electric Corporation were in no way related to the exchange offers made by Associated Gas & Electric Company, or affiliated companies, but were entirely independent transactions, based upon their own merits, and the directors of the corporation had no reason to assume that, because some of the preferred stockholders did not accept an exchange offer, they had any objection to the acquisition of a similar security as a part of the assets of the corporation."

As a result of the investigation by the New York Stock Exchange of the General Gas & Electric Corporation and its relationship with the Associated Gas & Electric Company, which controls it, the decision has been reached that the company belongs in the investment-trust classification and, accordingly, the company has been persuaded to follow the practices required of that group, with certain exceptions. Directors of General Gas have agreed, furthermore, that they will make no more investments in securities of Associated Gas or any of its subsidiaries or affiliates without first notifying all stockholders.

Election Day Cuts Weekly Output

Output of electric light and power companies for the week ended November 12 decreased slightly, compared with the preceding week, to 1,520,730,000 kw.-hr., according to figures announced by the National Electric Light Association. An approximately equal decrease occurred a year ago, so that the deficiency from 1931 remains at 6.3 per cent as it was in the week before.

In both years the week included Armistice day, which may have caused some reduction in demand; this year there was in addition a national election, probably with an appreciable decrease in the day's factory operations.

With the exception of New England each geographical division receded somewhat from its previous standing relative to 1931. Compensating gains in regions not separately tabulated prevented a similar recession in the country's total.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1932	1931	1930	1929
November 12	1,521	1,623	1,713	1,794
November 5	1,525	1,628	1,728	1,798
October 29	1,533	1,652	1,741	1,816
October 22	1,528	1,647	1,747	1,824
October 15	1,508	1,656	1,729	1,799

Per Cent Change from 1931

Region	Week Ended Nov. 12	Nov. 5	Oct. 29
Atlantic Seaboard	— 3.2	—2.6	—3.1
New England alone	— 1.0	—3.5	—2.7
Central industrial	— 8.9	—7.8	—9.2
Pacific Coast	—10.9	—9.1	—7.8
United States	— 6.3	—6.3	—7.2

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Value of Farm Load Featured in Report

That the development of farm electrification deserves vigorous support by the power industry, electrical manufacturers and rural betterment organizations is the inescapable conclusion of a 54-page report recently issued by the New Hampshire Agricultural Experiment Station at Durham under the directorship of W. T. Ackerman, and covering electrical operations on seven farms for the period from 1925 to 1930 inclusive. In March, 1927, a progress report on this project reviewed the results of two years' work, and this latter publication gives an exhaustive survey of operations for the entire period down to 1931. Complete data on energy consumption, costs of service, monthly takings of energy and extensive information on the equipment provided are included. Sixty major and 40 minor pieces of equipment were in use, covering 36 or more distinct operations and involving 50 or more makes of apparatus.

The average energy consumption of the group rose during the six years from 141 kw.-hr. per month to 428 kw.-hr. and the annual revenue from a typical farm from $132 to $234, the average rate per kilowatt-hour dropping from 7.92 to 4 cents. An important aspect of the development has been a well-defined tendency to increase the use of electricity over a period of years with little indication of reduced consumption as a result of financial stress, indicating the substantial qualities of the rural service load. Dairy farms registered peaks in summer and poultry farms in winter. The report emphasizes the necessity of developing the farmstead load in order to best realize the possibilities of rural service. Dairy and fruit farms show the better load characteristics, so far as this project went. Few serious difficulties have been had with electrical equipment, but the necessity for maintaining rural service departments in power organizations is apparent in view of the problems sometimes arising in connection with applications not fully seasoned or requiring engineering in their provision. Utility rates have steadily trended downward, and the report points out that rural schedules should take into account the combination of power load and residential service represented by the typical farm.

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"Associated Violated Laws" Says Commission

Attorney-General F. W. Johnston of New Hampshire has been asked by the Public Service Commission of that state to proceed in the Superior Court against the New Hampshire Gas & Electric Company and the Derry Electric Company, subsidiaries of the Associated Gas & Electric system, on the ground that violations of the state law have been entered into by these interests. The counts against the utilities are contained in eleven orders issued by the commission last year (ELECTRICAL WORLD, July 25, 1931, page 136) in a 27,000-word opinion which attempted to remedy what the commission regarded as interference by holding companies with the proper regulation of these operating properties in New Hampshire.

Among the matters covered are the borrowing of money by the open account method, management contracts, sale of appliances for and on behalf of the Associated Appliance Corporation, acquisition of the Derry company by the New Hampshire Gas & Electric Company, sale of Associated stock during business hours by local company employees, location of bookkeeping offices and maintenance of general offices and staffs of so-called foreign trusts or corporations outside the state. The latest action is the result of a suggestion to the commission in a recent ruling of the New Hampshire Supreme Court (ELECTRICAL WORLD, October 8, 1932, page 482) declaring that the commission's orders were unauthorized, as they did not pertain directly to rates or service. No hearing date has as yet been fixed.

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State Water Power Voted in Oregon

An amendment to Oregon's constitution permitting state development of water power appears to have passed by a safe margin in the recent election. Incomplete returns from 1,585 of the state's 1,783 precincts showed 145,796 favorable votes, with 110,739 against, indicating passage of the amendment by about 1.3 to 1. Eight counties rejected the amendment, most of these being among the more thinly populated coun-

ties in the eastern and southeastern sections of the state. Multnomah County, including Portland, indicates a ratio of 1.4 to 1 in favor of the amendment.

The amendment strengthens the present policy of the state on the ownership and control of the development of its water-power resources. It also authorizes the state to lend its credit and incur indebtedness to an amount equal to 6 per cent of the assessed valuation of all the property in the state for the purpose of developing, selling or leasing water power and acquiring, constructing and operating hydro-electric power plants, transmission lines and distribution lines. It also provided for administration by a three-member elective board.

The State Grange sponsored the measure with the stated hope that it would assist power utility districts now or hereafter to be formed to acquire low cost power from state plants. Other proponents envisioned a huge state project with interconnected plants, wholesaling power to utility districts and private companies. Many felt the amendment would advance the cause of federal development on the Columbia River, since it would place the state in a position to contract with the federal government for power developed there in federal-owned plants.

▼

New York Metal Prices

	Nov. 9, 1932 Cents per Pound	Nov. 15, 1932 Cents per Pound
Copper, electrolytic	5.3125	5.375
Lead, Am. S. & R. price	3.15	3.15
Antimony	5.75	5.875
Nickel ingot	35.00	35.00
Zinc, spot	3.35	3.50
Tin, Straits	23.80	24.15
Aluminum, 99 per cent	23.30	23.30

▼

Ajax-Northrup-Westinghouse

Ajax Electrothermic Corporation announces that in order to stimulate the growth of its industry the Westinghouse Electric & Manufacturing Company has been licensed to make high-frequency or coreless induction furnaces or heaters for certain applications in the field of heating. The corporation has received a license from Westinghouse to use certain patents of the latter company. It is anticipated that this new arrangement will stimulate the development and use of the high-frequency or coreless induction furnace.

▼

Hygrade-Sylvania Earns Dividend

Though the sale of lamps and radio tubes for the nine months ended September 30 by the Hygrade-Sylvania Corporation fell 18 per cent below the corresponding period last year and dollar values of sales 36 per cent, the company earned its $1.50 per share dividend for the period and reports a ratio of current assets to current liabilities of 6.8 to 1. The finished goods inventory of the company represented about six weeks' demand. Officials of the company anticipate a satisfactory volume of business in the final quarter with further improvement in current assets position.

▼

Westinghouse Promotes Study of Products Distribution

Recognizing the importance of an adequate knowledge of sales methods and of the problems involved in the distribution of engineering equipment, the Westinghouse Electric & Manufacturing Company is co-operating with the University of Pittsburgh in conducting a graduate course in engineering distribution of capital products. The course, given under the direction of Bernard Lester, assistant sales manager of the Westinghouse industrial department, will take up problems in the sale and distribution of engineering equipment and machinery required by industry; a study of the industrial market; methods employed in economic distribution, direct and through sales features of engineering products; organization and supervision of sales force, sales methods, specifications, proposals, sales presentation and use of sales aids; problems involved in ordering, packing, transporting, installing, servicing, supplying repair parts and meeting foreign needs.

Although the course has just begun, the enrollment is already completed. In fact, 50 per cent more than could be accommodated applied for admission.

Since 1927 the University of Pittsburgh and the Westinghouse Electric & Manufacturing Company have offered co-operative engineering education through the university graduate school. This program has been given by engineers of Westinghouse research and design divisions and the university faculty members and included courses in electrical and mechanical engineering.

Major New Construction This Week

Four hydro-electric plants, substations, transformers and auxiliaries, transmission and distribution lines needed by Verde River Irrigation and Power District, Phoenix, Ariz., to cost about $3,216,000.

Machine drives, motors, conveyors, etc., required by Theodore Hamm Brewing Company, St. Paul, Minn., at cost of about $200,000.

Pacific Gas & Electric Company has created fund of $5,000,000 for extensions and improvements to system.

Heavy-duty motors, controls, transformer equipment, electric pumping machinery, compressors, etc., for refinery of McNutt Oil & Refining Company, at Las Cruces, N. M. Estimated cost $100,000.

Until December 12, Aberdeen, S. D., asks bids for electric generators, Diesel engines, switchboard and instruments, traveling crane and auxiliary equipment for city-owned electric light and power plant, distribution and lighting system.

Machine drives, motors, controls, pumping machinery, tanks, conveyors, etc., for plant of Lackman Brewing Company, Cincinnati, Ohio. Estimated cost $250,000.

Electric pumps, transformers and substation equipment for water supply development project of Twin Lakes Reservoir & Canal Company, Olney Springs, Colo. A $1,125,000 project.

Central Massachusetts Mergers

Merger of the Central Massachusetts Electric Company and the Ware Electric Company through a share-for-share exchange of common stock has been approved by the Massachusetts Department of Public Utilities. Both properties are under the management of the New England Power Association. Rates and net incomes per share are similar and the commission points out that operations will be simplified and complications in the allocation of power costs eliminated by the merger. Merger between the Northampton Electric Lighting Company and the Mill River Electric Company has also been approved.

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Delinquent Electrical Accounts

(National Electrical Credit Association)

Number of Accounts Reported

Division	October 1931	October 1932	Per Cent Inc. or Dec.	Ten Months 1931	Ten Months 1932	Per Cent Inc. or Dec.
New York	263	174	—33.8	2,409	2,353	— 2.3
Middle and Southern Atlantic	87	89	+ 2.3	1,166	1,053	— 9.7
New England	79	82	+ 3.8	920	992	+ 7.8
Central	558	335	—40.0	5,603	4,476	—20.1
Total	987	680	—31.1	10,098	8,874	—12.1

Total Amounts Reported

New York	$35,514	$15,448	—56.5	$311,829	$208,950	—33.6
Middle and Southern Atlantic	9,627	5,095	—47.0	146,833	92,249	—37.0
New England	4,779	7,473	+56.4	79,625	78,777	— 1.0
Central Division	45,494	20,088	—55.8	503,955	313,624	—37.8
Total	$95,414	$48,104	—49.6	$1,042,042	$691,600	—33.6

Illinois Commission Inquiry?

Investigation of members of the Illinois Commerce Commission with the purpose of bringing suit to forfeit the bonds of any found to be engaged in private business has been requested of the state's attorney of Cook County by the Utility Consumers and Investors' League. The league charges that Commissioner W. H. Wilson retained positions as a bank officer, while serving on the commission, and alleges its belief that Commissioners P. W. Collins, W. M. Brinkman and Rice Miller are engaged in private business, thus violating the law.

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Pasadena Unit Ready

So far has progress advanced with the new 32,500-kw. steam turbo-generator installation for the Pasadena, Calif., municipal that service with it will probably begin about December 1. This unit will bring the station generating capacity to 60,000 kw.

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Consolidated Gas Dedicates Tower

In memory of the 3,052 officers and employees of the Consolidated Gas Company of New York and its affiliated electric, gas and steam companies who served in the World War and the 74 who gave their lives, the tower of the company's building at Fourteenth Street and Irving Place was dedicated November 10 as a Tower of Light. A bronze plaque, to be placed in the main corridor of the building, was unveiled by William C. Morris, vice-president.

▼

Utility Subject to Road Levy

Land owned by a public utility is subject to assessments levied by a road improvement district in which it is situated, Attorney-General U. S. Webb of California has ruled in an opinion addressed to the State Board of Equalization. Payment of the "in lieu" gross receipts tax does not include such an assessment, the opinion explained and the easement of a public utility over streets and highways within the district is not subject to assessment. There is a possibility that the State Supreme Court will hold otherwise.

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Crisp County Suit Deferred

Hearing of a petition for an interlocutory injunction filed in the Americus Division of the United States District Court by the S. J. Groves & Sons' Company against the Crisp County Power Company, in which the plaintiff seeks to restrain further disbursements by the power company, has been deferred by agreement of counsel. The S. J. Groves & Sons' Company, sub-contractor in the construction of the Crisp County Power Company's dam, claims more than $100,000 to be due it and is seeking to collect through the courts.

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California Ruling Appealed

In a brief to the U. S. Supreme Court the Los Angeles Gas & Electric Company, seeking reversal of a District Court decision, protests that the California Railroad Commission failed to give independent consideration to evidence and instead considered its suit as a proceeding to determine whether there was any evidence in support of the commission order. At stake is the question of whether or not a return of 7.7 per cent on historical cost and 7 per cent on present fair value is reasonable.

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Alabama Tax Measure Fails

Defeat of the proposed state income tax was voted by Alabama at the general election of November 8. This would have placed a tax of 5 per cent or more on all corporations, including electric light and power companies (ELECTRICAL WORLD, October 22, page 551).

▼

Rate Cut Ordered in North Carolina

Durham (N. C.) Public Service Company has been ordered by the state Corporation Commission to reduce its rates by an aggregate of $62,000 a year. This is the first result of the commission's drive for lower rates throughout the state (ELECTRICAL WORLD, October 29, page 579). The rates will, according to the commission, grant "the littlest customers some real reductions."

▼

British Power Project Advances

Another stage has just been reached in the British Aluminum Company's great Lochaber hydro-electric project, with the clearing of the last section of rock in the Laggan pressure tunnel. Through this tunnel the waters of Loch Laggan and the Spean River will flow into Loch Treig. The scheme of which it forms a part will constitute the largest single hydro-electric power station in the United Kingdom. The works include three major and fourteen smaller dams, 18 miles of pressure tunnels and 1 mile of pipe line and tailrace.

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Australian Hydro Now Building

Development of the electric power potentialities of Barron Falls, near Cairns, Queensland, Australia, after many years of contemplated action is now under way. Service to nearby towns and rural farming projects is planned.

Refrigeration Bureau Offers Prizes

To encourage both central stations and dealers to put in holiday electric refrigerator displays which sell, the Electric Refrigeration Bureau of the National Electric Light Association is offering seven cash prizes of $100 each, central stations being eligible for three of them and dealers other than central stations for the other three. In addition to these, a prize of $100 is offered as an award of special merit to any dealer or central station whose display is the most meritorious in the entire contest.

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Westinghouse Refrigerators Gain

Sales of Westinghouse refrigerators, according to R. C. Cosgrove, manager of that company's refrigeration division, have shown notable improvement. Orders entered during September exceeded those for August by 59 per cent in dollar volume and were 17 per cent ahead of September, 1931.

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Chicago Appliance Sales Up

More than the customary seasonal activity was shown in October in the sales of electrical appliances and household lamps, it is revealed in the monthly survey conducted among 623 wholesalers by officials of the Chicago Merchandise Mart. In electrical goods of all kinds, mainly lamps, there was a decided increase, varying from 10 per cent to 60 per cent over September business.

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California Rate Cut Ordered

Following an investigation of the rates of the Coast Counties Gas & Electric Company, a Pacific Public Service subsidiary, on the motion of the California Railroad Commission, the utility has been ordered to cut its rates at an estimated loss in annual revenue to the company of $40,500.

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G. E. Employees Continue Insurance

Employees of the General Electric Company on September 30, 1932, held $151,762,836 insurance, of which $65,109,836 was free, given employees with the company one year, and $86,653,000 additional insurance carried by the employees at attractive rates obtained by virtue of their employment with the company. The amount of insurance in force on September 30, 1930, was $179,111,837. In percentage figures, however, the decline in the number of insurance holders is only half as great as the drop in the number of persons on the payroll, showing that thousands of employees who have been temporarily laid off continue their insurance.

Hoover Dam Progresses, Diversion Tunnels in Use

Subjugation of the Colorado River which is ultimately to produce a $165,000,000, 1,200,000-hp. project has reached the point where the muddy flow that in ages past carved a mile-deep gorge in desert rock now ignominiously slinks through a 50-ft.-in-diameter man-made tunnel, while the forces that will harness the river work diligently at the dam-site itself.

This week the charge of dynamite was fired which enabled engineers, after a year's work, to divert the stream from its bed for a distance of nearly a mile. Next on the program is the building of earth-fill dams, above and below the site of the true dam, to permit deep excavations for foundations in the river bed. These foundations will probably extend to a depth of 130 ft. below the present river bed. Four hundred thousand cubic yards of rock will be excavated.

The dam itself will contain some 3,400,000 cu.yd. of material, including 5,000,000 bbl. of cement. Three years may be required to place the concrete.

President Hoover stopped off for an hour and a half to visit the site on his way back to Washington this week and stated while there that it would mean "millions of happy homes for Americans out under the blue sky of the West."

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Morris L. Cooke Reverts to Distribution Costs

Publicity for the St. Lawrence power and navigation project is being broadcast by radio in a series of six weekly programs. Morris L. Cooke, consulting engineer and trustee of the New York state power authority, made the first address of the series this week declaring that New York state small consumers paid each year $150,000,000 for the distribution of the energy they purchased, as distinct from generating and transmission cost factors. The equivalent for the entire country, said Mr. Cooke, is $1,000,000,000 a year. He criticised the electrical industry and regulating agencies for failure to develop or require cost accounting which would show this cost in detail. That such costs were or might be completely justified by limitations of the art was not denied.

Mr. Cooke hailed the impending harnessing of the International section of the St. Lawrence as "the most important single step in the history of electrical development" and one which opens "a new era in the social and industrial progress of New York."

"To stipulate in the contract for St. Lawrence power that the companies using it shall practice cost-finding would open the door to a new day," said Mr. Cooke, "simply because it would enable us to compare the distribution costs of different companies and thereby enable one company to profit by the experience of others, a process which in the last ten years has cut in half the coal required to generate electricity."

Mr. Cooke, it would appear, still lingers under the spell of Ambassador Sackett's World Power Conference speech and is intuitively conscious of some possible way of separating costs as between classes of customers and type of use and then regrouping by classes of doubtful equality.

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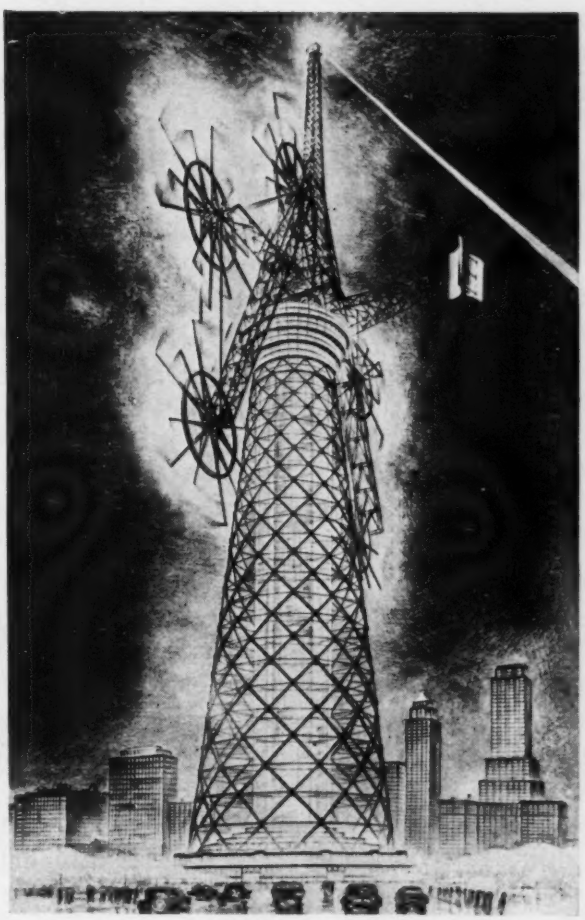
Wind Power Tower Planned for World's Fair

Following experimental work abroad, German engineers have planned a 2,000-ft. tower with five wheels, each of about 360 ft. diameter, which as a unit would be capable of producing 80,000 hp., according to the bright dreams of the inventors. Recent advices from overseas indicate that Germany may erect this structure at the World's Fair Century of Progress Exposition in Chicago. A restaurant ten stories high to accommodate as many as 15,000 persons at one time is also discussed (ELECTRICAL WORLD, August 13, 1932, page 201).

High-speed elevators would carry 4,000 persons an hour to an observation platform 1,933 ft. above the ground.



Direct Generator-to-Line Tie Used at 33,000 Volts

In the installation of the new turbo-generators at the municipal power plant in Swansea, England, generation at 33,000 volts has been adopted as standard. Energy is fed directly to the outgoing overhead grid lines without the incorporation of step-up transformers. The two turbines are each of 30,000 kw. rating.

Parsons & Company, which four years ago installed a 25,000-kw. machine, generating at 14,500 volts at the Brimsdown station of the North Metropolitan Power Company, also made a second installation there and at present is building turbo-alternators of high voltage type for Capetown Corporation and for the Upper Boat station of the South Wales Electric Power Company.

Another distinction of Swansea's Tir John power station is that its boilers per cent. This will be burned in pulverized form. Combustion air will be preheated to 700 deg. F.

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270 Tons of Mercury

Mercury ordered by the General Electric Company for the steam-mercury boilers and generating units of the Kearny station of the Public Service Electric & Gas Company and of the General Electric Company at Schenectady is equivalent to approximately 89 per cent of a full year's consumption by the United States for all purposes. Probably the largest shipment ever made, that of 135 tons valued at $178,000, was delivered in 3,553 iron flasks for Kearny last week.

EDITORIALS

L.W.W.MORROW
Editor

To a Newly Elected President

IF THE executives and busy workers of the electrical industry could, in a common voice, speak their feelings for you today, Mr. Roosevelt, they would, we are sure, join in wishing you every success in such efforts as you may make to drag our country from the morass of trade inactivity and lethargy. You have been chosen as our next President by an overwhelming tide of ballots; you represent, therefore, the faith and hope of the American people in a new deal.

From time to time, as Governor of the State of New York, you have seen fit to criticise the policies and purposes of the electric light and power industry both as a collective and many-unit enterprise. You have pleaded for more and better regulation of the industry. You have induced reforms in the regulatory laws of New York and have selected as chairman of the Public Service Commission there a man who has to a large measure militantly, courageously and effectively carried out the basic principles of your tenets. You have not always been kindly in your attitude to the utilities, because you differed with many managements as to the basic principles involved. You have not always been quite fair, because you did not understand the fundamental technical problems and, like many eager idealists, did not see clearly the difficulties to the direct action that you so warmly championed. But essentially, Mr. Roosevelt, there is no difference between your major *objectives* and those of enlightened utility managements. A widespread use of electricity at reasonable rates for economic and humanitarian purposes is your goal and that of the industry.

In your campaign speech in Portland, Ore., you urged these things:

Full publicity as to security issues and earnings,
Publicity as to ownership of securities,
Publicity as to intercompany contracts,
Regulation and control of holding companies by the Federal Power Commission,
Co-operation by the Federal Power Commission and state regulatory bodies,
Regulation and control of issuance of stocks and bonds on the prudent investment principle,
Abolishing the reproduction-cost theory of rate making and legislating to make it a crime to circulate false information about utilities.

UTILITY LEADERS also have stated policies and practices which, if adopted, will enable the electric service organization to bring to the people of the country the services which they want and should reasonably have. These leaders have been less dogmatic, however, as to detail and method and contented themselves with a statement of objectives such as:

Securities issued should cover actual investment values subject to commission audit.
Rates should be based upon the principle of the greatest good to the greatest number and without injustice to any one.
There should be full publicity of corporate policies, earnings, contracts, security issues and any other phase of customer and investor interests.
There should be such adequate regulation of all securities as will prevent fraud and false representations, no matter what the industry or the character of the investment trust.

In terms of objectives therefore, Mr. Roosevelt, we think that you and the enlightened management of the power industry can agree. The only question is how to achieve the end. It takes time for ideas and ideals to percolate through a complicated social and economic structure. We feel that the electrical industry is far closer to its

ideals, and yours, than you now suspect, and that within the limits of human error and responsiveness the march of progress will continue. Despite all that the critics of the industry have alleged, that service body has a tremendously acute sense of duty to the public and a highly idealistic sense of obligation as to the character of the service it renders.

We ask on behalf of the industry that you plan your actions in regard to the electrical industry with an understanding heart, forbearance and patience. We ask that you consult more with enlightened utility managements and less with those who criticise and theorize about the industry without a full understanding of its organizations, operations and policies. We can assure you of competent and constructive and unselfish help from electrical leaders. We wish you, Mr. Roosevelt, every success in your new burdens and assure you of our willingness and desire to cooperate toward mutual and, it would appear, identical ends.

Guesses are good no longer

CONSTANT pressure for lower rates from all sides makes it imperative that electric utilities actually know the determinable costs of serving their different classes of business. To guess, to assume, the important factors that decide the difference in prices of identical kilowatthours offered to industrial and domestic customers is rapidly becoming just not good enough. These factors must be known and the only way to know them is to devote hard work uncovering them.

The Commonwealth Edison Company (Chicago) is engaged on that job right now. A part of it is completed, the study of residence load, and is reported in this issue of ELECTRICAL WORLD. There have been plenty of residence load studies before all over the country, but the results of them, more or less frankly admitted, have been arguments from the specific to the general case, and in many instances the amount of specific data is woefully small to support the general assumptions derived from it. This is not the case in the present Chicago study. The results have the validation of the largest mass of specific data that has ever been collected in an investigation of this kind. Acknowledging the fact that other elements than investment costs enter into the determination of fair rates, it is the part of wisdom to get detail engineering and investment data to form the foundation for rate and sales programs.

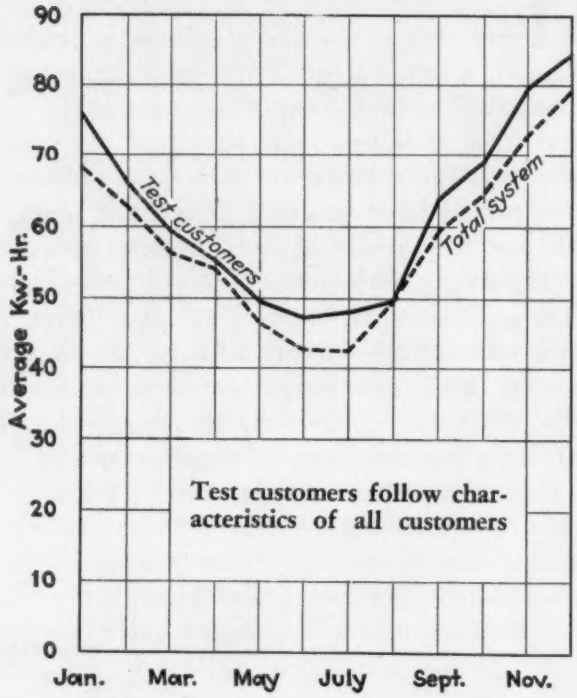
Quit dreaming of yesterday

MANY enterprises in the electrical industry are content to say "business is terrible" and "when will the good old days come back." They have quit and are waiting at the gate. Such an attitude fails to appreciate either the present business opportunities or the great industrial changes that have occurred whereby it is impossible for "the good old days to come back" just as they were. Other enterprises, however, have taken a different attitude. They say "never was there a better opportunity to enter the electrical business" and "now we can get action in the electrical markets." They are thinking and acting to bring about their own business prosperity.

This electrical industry is only 40 per cent developed. Each market has been carefully surveyed and the grand aggregate of electrical service and equipment sales possibilities to the home, the farm, main street, industry and transportation is some $51,000,000,000—an astounding sum. This is no time to rest, no time to say the utilities have 25 per cent excess capacity, no time to say no one is buying, no time to think that past production, sales, distribution and price standards are correct for present conditions.

It is a time for unbiased study of markets, of production, of distribution and of sales with the one objective in view—to sell the markets in volume and economically. If purchasing groups are inert they must be awakened, if old investments and present prices are incorrect and handicap sales, then they should be changed. In view of the market possibilities this industry can write off an enormous loss in capital, in organization, in production and in distribution, and yet in a few years make over-all profits that will make present losses negligible. It is not time to throw good money after bad because of obsolete organizations, investments and practices. Good money should be put into those activities and investments that will develop present markets under present economic conditions. This industry has a great future if it will work for it, if it will bring its own tomorrow and quit dreaming about its yesterdays.

Residence Load Characteristics Based on Field Studies



Guesses and assumptions as to diversity and load factor practically eliminated from rate and cost determinations for domestic services by extensive survey of time occurrences and quantities of energy usage in large number of typical homes.

THAT the average load factor is 31 per cent, that the diversity factor with regard to the system peak* is 1.42 and that lighting and appliances account respectively for 49 and 51 per cent of energy used are facts concerning its domestic load that now are known, not just guessed at, by the Commonwealth Edison Company. These facts, with many others as significant, were determined by a recently completed study of domestic loads that covered a period of more than a year and included observations of service use in seven different classes of residence sections.

A thorough knowledge of these factors is very desirable in any study of rates. Similar studies made in the past and applied to the larger industrial business proved of great value in the development of certain types of business, such as refrigeration, electric vehicle charging and other types of business where a low development rate was needed. But while load factor and diversity may be determined quite readily with the larger railway and industrial customers, it is difficult to fix them accurately in the far-flung, individually small and greatly diversified residence business, where the load is never large enough in any single case to warrant the installation of the necessary instruments.

A careful preliminary field inspection was made, resulting in the selection of seven residential city blocks, representing all the varied types of this class of business, and totaling some 400 customers, about the equivalent of a city of 1,500 to 2,000 population. These locations are pictured here to show the different types of customers tested. Housings were built upon poles and watt-hour meters and recording wattmeters were installed on the low-tension side of the transformers to determine the daily kilowatt-hour and load curve of all the customers in the different blocks. The graphic charts were taken bi-monthly for a period of more than two years.

On one of the graphs here reproduced the kilowatt-hours for the total residential system of the company are plotted monthly for a year period and the monthly kilowatt-hours used by the 400 representative customers included in the test are superimposed on this curve. The result shows that these selected blocks of customers are typical of the average for the company. The two curves follow each other very closely in their monthly variation. However, the test customers are slightly larger, averaging 749 kw.-hr. per year per customer, as compared with 695 kw.-hr. in 1930 and 739 kw.-hr. in 1931 per customer for the entire company.

The test customers also averaged 5.2 rooms per customer, as compared with 4.8, which is approximately the average number of rooms for all customers. This is about as close to the average as any cross-section of the company's business could be.

As a result of a former study of lamp renewals it

Table I—Principal Appliances Used in Chicago

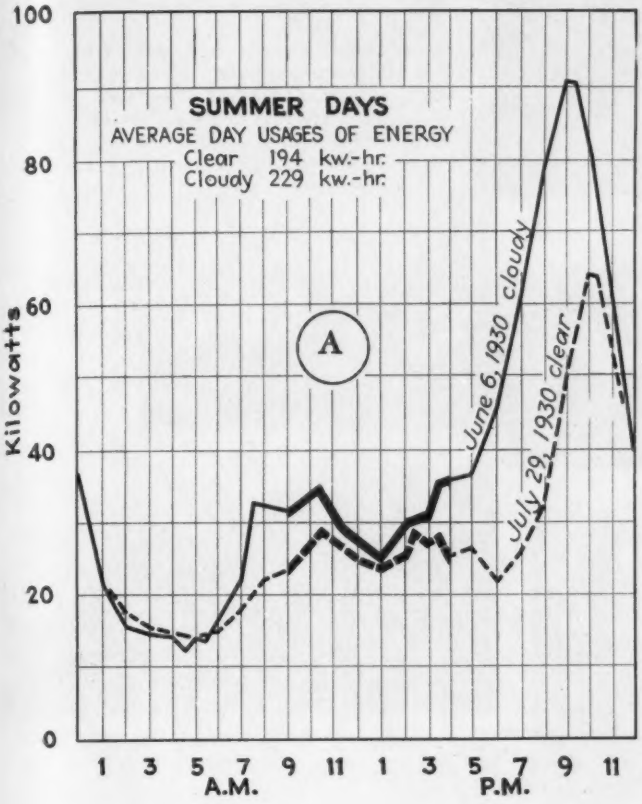
	Per Cent of Saturation	Prorated No. of Appliances in Chicago		Per Cent of Saturation	Prorated No. of Appliances in Chicago
Washing machines	40.0	321,400	Percolators	17.2	138,200
Vacuum cleaners	88.0	707,000	Sewing machines	12.6	101,200
Ironers	7.5	60,300	Fans	9.1	73,100
Refrigerators	11.2	90.000	Heaters	9.1	73,100
Flat irons	97.0	779,300	Radios	64.9	521,400
Toasters	36.4	292,500	Total		3,157,500

"Diversity" throughout this article refers to diversity with respect to total system peak except where context explicitly indicates otherwise. This term should not be confused with diversity factor of residence lighting. The higher this diversity the lower the load factor and vice versa.

By G. L. JORGENSEN
and R. L. MATTESON
Assistant Statistician and Statistical Engineer
Commonwealth Edison Company, Chicago

was estimated that the residential load is divided about equally between energy used for light and that used by appliances. This estimate was based upon the number of lamps of known wattages in service, the load factor being computed from the average life of the lamp and the number of renewals. This early estimate is substantiated by the results of this later test made on the seven representative blocks.

Of course the load during the evening is principally lighting, and during bright, sunny days practically the entire day load is made up of appliances. The morning and evening lighting peaks and the differences between bright and dark days bear out this general statement;



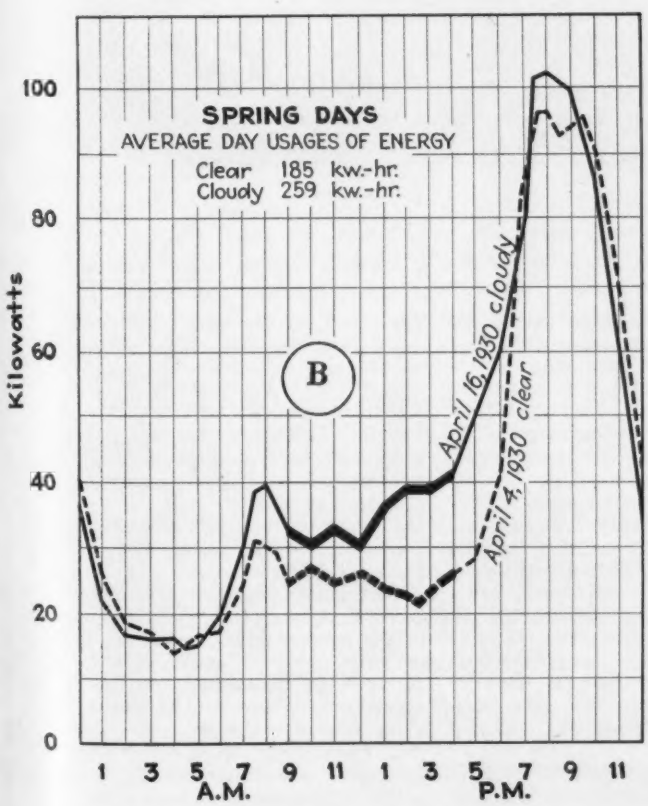
Seasonal variations of load in the test group

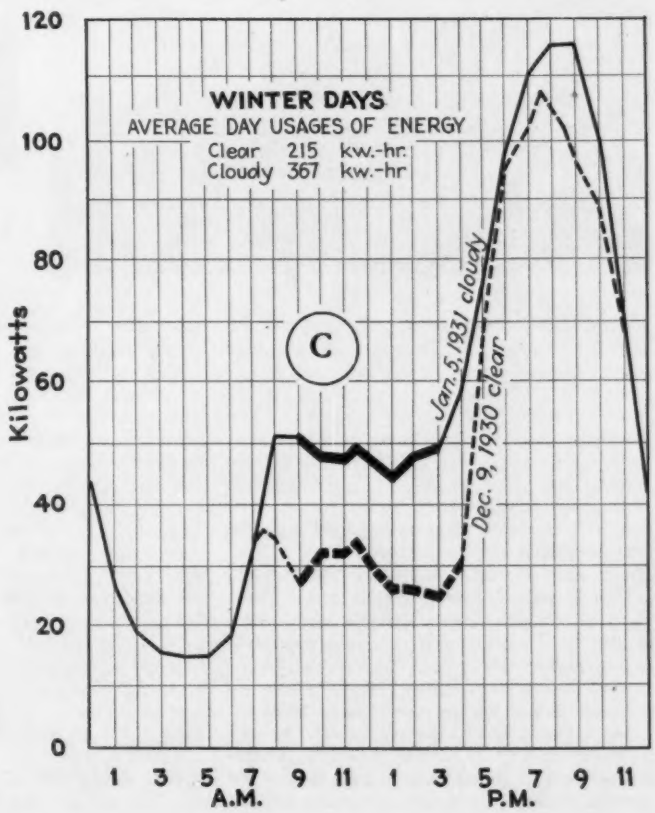
The day loads for all seasons of the year and different days of the week are quite similar when weather conditions are reasonably comparable. Heavy portions of lines indicate day periods when load is dominated by appliances. Comparison of the winter and summer morning peaks, in the first and third graphs, shows the effect of the lighting load.

(A) Cloudy and clear summer days plotted together to show the effect of the increased lighting load. On the cloudy day a very pronounced morning load is noticeable and the evening load is more similar to a winter evening; that is, with a greatly increasing load after 6 p.m. The summer evening lighting load on clear days is low, not only because of the season but because Chicago has daylight savings in effect from about May 1 to October 1. Sunset is at approximately 7:30 p.m. C.S.T. at this time of the year.

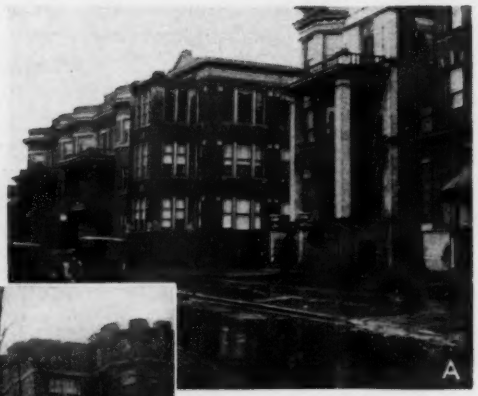
(B) Clear and cloudy spring days. The increased day load is shown, while the evening load, due to earlier sunset than in the preceding chart, is almost the same in size. This graph can be taken as representative of load conditions in autumn.

(C) Large increase in the day load in winter, caused by one of those very dark winter days. The evening load on both days is quite similar, and even on the clear day there is a pronounced morning lighting peak. January 5, 1931 (very dark and cloudy), shows an average day of usage of energy for the test group of 367 kw.-hr., the highest during the period studied, 70 per cent higher than the usage for December 9, 1930, a clear day. The evening lighting peak for the two days was practically the same.





Seven classes of residence loads were studied



Note that the pictures are lettered in order of load factor and that the highest and lowest class homes in the study contend for the distinction of lowest load factor. Two distinct load factor groups are apparent. The low load factor group from 21.7 to 23.3 per cent indicates that income classifications are probably poor indices of electricity use, for high, low and intermediate incomes are represented in this group. The other group, with load factors from 27.3 to 32.4 per cent, seems to demonstrate that the dwellers in apartment and rooming houses are the freest users of electricity.

(A) The largest group of customers on any one transformer included in the test, some 180 customers being metered simultaneously. They are located in the largest rooming-house district in Chicago. The buildings are of the large type, renting furnished rooms, and also furnished and unfurnished apartments. The average rooms per customer is about four. The group required a maximum load of 57.6 kw. occurring the half-hour ending 8 p.m. on January 22, while using 163,240 kw.-hr., a load factor of 32.4 per cent, the highest of any location in the group. The load at the time of the system peak was 36.0, giving a diversity factor of 1.60.

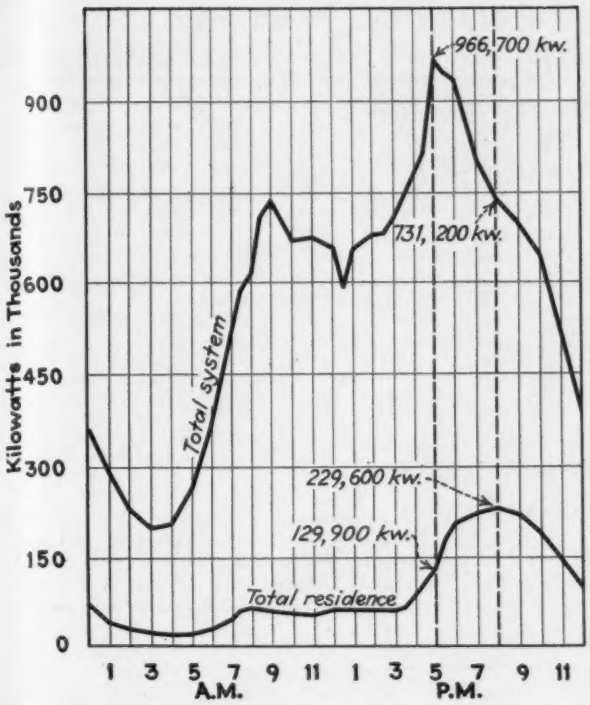
(B) A group of about 35 customers all housed in one large apartment building. They occupy, with the exception of six living in the front of the building, apartments of the three-room kitchenette type with a central refrigerating plant in the basement. Duplicate metering equipment is installed on the refrigerating machine. Including refrigeration, the load of the maximum day was 11.4 kw. occurring on December 29, at from 9 to 9:30 p.m. Their annual load factor is 27.9 per cent and the diversity factor 1.46, both figures including the refrigeration load.

(C) Neat-looking wood and brick bungalows, averaging between five and six rooms, on narrow lots, and built closely together. There are about 25 customers on this test, requiring a maximum winter load of 8.1 kw., occurring on November 27 at the half-hour ending at 6:30 p.m. Their load at the time of the system peak was 5.0 kw., giving them a diversity factor of 1.62. As a group, these customers have an annual load factor of 27.3 per cent.

(D) Here are 77 customers on test in the lower, but not the lowest, class of residences in the city. This block is located near the "back-of-the-yards" district in Chicago. The houses are for the most part of the high-foundation, story-and-a-half type, occupied by the poorer class of people. This group required a coincident maximum load on November 29 of 19.2 kw. from 7 to 7:30 p.m. and showed an annual load factor of 23.3 per cent. At the time of the system maximum their load was 10.8 kw., giving them a diversity factor of 1.78.

(E) Fairly high-class residences of the medium type. Buildings divided about evenly between brick bungalows and frame or brick two-story houses of average size, all built on good-sized lots, nicely landscaped, etc. They are located in a high-class but not exclusive neighborhood. On this transformer were metered some 21 customers averaging about six rooms each.

(Continued on page 687)



Residence peak compared with system load on same day

This graph of the day of the residence peak as indicated by the survey (December 29, 1930) shows that while the residence load has had a considerable rise at the time of the system peak, it continues to rise until its peak at 8 p.m., while the total system load has been decreasing. This total residential load curve is constructed by applying the results of the study to the total residential kw.-hr. used.

this is graphically shown on the accompanying load curves.

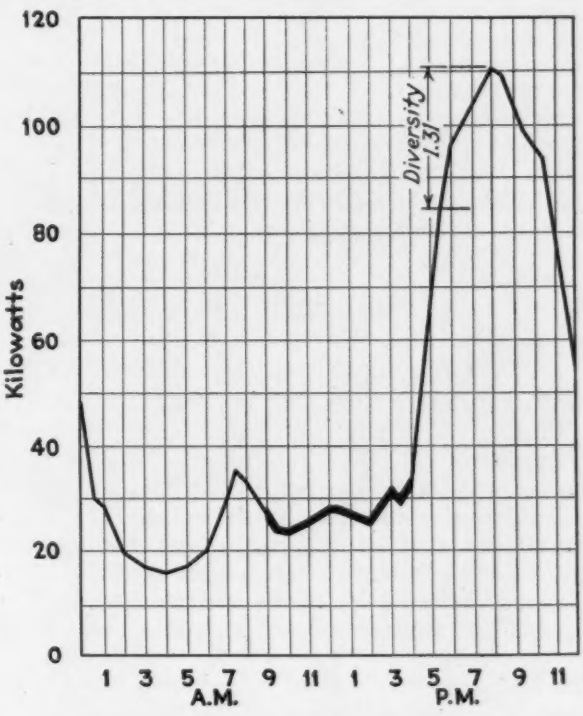
The principle used in this study was, first, to divide the total kilowatt-hours between daylight and night use, and, second, to eliminate the appliance load from the energy used at night and the lighting load from the energy used during the daylight hours. To accomplish this, the half-hour load characteristic for the 400 customers was tabulated for every eighth day for a full year, and from this the split-up was made in the kilowatt-hours between those used between sunset and sunrise, and vice versa. All of these days, used as samples at regular intervals of eight days falling in any given month, were added together, thus reducing the ratio of energy used in daylight and darkness to a monthly basis.

The problem then became one of determining the amount of energy used by the various appliances during the night and also the amount of energy used for lighting during the day.

During the year a survey was made of some 9,200 customers to determine appliance saturation. Table I shows the results of this survey as regards the major appliances that have entered into this computation, projected to the total number in use in Chicago.

By making a series of deductions and corrections based on this survey and other surveys which show the average number of different appliances in the average home and from other surveys and estimates indicating the actual average use of these appliances the division of residential energy used between lighting and power or appliance load was determined.

The number of any given appliance multiplied by the rating in watts, and again multiplied by the average number of hours' use per day, gave the total kilowatt-hours used by the appliance. These kilowatt-hours compared with the total residence kilowatt-hours gave the portion of the total residence kilowatt-hours chargeable to the particular appliance in question. These kilowatt-hours used by appliances, with reasonable expectancy of night use, were then divided in direct proportion to dark and daylight hours. For example, with 90,000 refrigerators in use in Chicago, the average



Residence load and diversity

On the day of total system peak for the winter, November 26, 1930, the weather was cloudy. The load factor of the residential load was 24 per cent and its diversity in respect to the system peak was 1.31.

They had, on January 5, 1931, at the half hour ending at 8 p.m., a maximum load of 11.3 kw., giving them a load factor of 23.2 per cent for the year. Their load at the time of the system peak was 7.4 kw. or a diversity factor of 1.53.

(F) This block requires a maximum laod of 16.3 kw., which occurred on December 31, between 7 and 7:30 p.m. It included about 50 customers. These are divided about evenly between the ordinary two-flat type of buildings and residences of the lower class. The block will average between five and six rooms per customer, and as a group shows a 22.5 per cent annual load factor. The load at the time of the system peak, which occurred on November 25, between 5 and 5:30 p.m. was 11.7 kw., giving them a diversity factor of 1.39.

(G) The test here includes some of the highest class of residence customers on the company's lines—about fifteen of them, living in large homes, on very large lots, but not of the "estate" type. They average between eight and nine rooms each and require a maximum load, occurring on December 29, of 11.4 kw., giving them an annual load factor of 21.7 per cent, the lowest of any of the seven groups. The load at the time of the system maximum was 6.6 kw., which means a diversity factor of 1.73.

Table II—Division of Residence Kilowatt-Hours Between Light and Power

	Daylight					Dark					Total Daylight and Dark				
	Kilowatt-Hours			Per Cent of Total		Kilowatt-Hours			Per Cent of Total		Kilowatt-Hours			Per Cent of Total	
	Total	Light	Power	Light	Power	Total	Light	Power	Light	Power	Total	Light	Power	Light	Power
January	1,420	51	1,369	3.6	96.4	3,138	2,401	737	76.5	23.5	4,558	2,452	2,106	54	46
February	1,421	61	1,360	4.3	95.7	2,865	2,143	722	74.8	25.2	4,286	2,204	2,082	51	49
March	1,406	80	1,326	5.7	94.3	2,335	1,877	458	80.4	19.6	3,741	1,957	1,784	52	48
April	1,489	90	1,399	6.0	94.0	1,906	1,532	374	80.4	19.6	3,395	1,622	1,773	48	52
May	1,171	78	1,093	6.6	93.4	1,070	915	155	85.5	14.5	2,241	993	1,248	44	56
June	1,555	107	1,448	6.9	93.1	1,197	1,028	169	85.9	14.1	2,752	1,135	1,617	41	59
July	1,404	102	1,302	7.3	92.7	1,162	983	179	84.6	15.4	2,566	1,085	1,481	42	58
August	1,344	92	1,252	6.8	93.2	1,303	1,074	229	82.4	17.6	2,647	1,166	1,481	44	56
September	1,334	79	1,255	5.9	94.1	1,738	1,253	485	72.1	27.9	3,072	1,332	1,740	43	57
October	1,421	68	1,353	4.8	95.2	2,509	1,849	660	73.7	26.3	3,930	1,917	2,013	49	51
November	882	36	846	4.0	96.0	2,181	1,564	617	71.7	28.3	3,063	1,600	1,463	52	48
December	1,385	50	1,335	3.6	96.4	3,225	2,409	816	74.7	25.3	4,610	2,459	2,151	53	47
Total	16,232	894	15,338	5.5	94.5	24,629	19,028	5,601	77.3	22.7	40,861	19,922	20,939	49	51

Table III—Load and Diversity Factors

(From February 1, 1930, to January 31, 1931)

Group	Maximum Date	Maximum Time	Number of Customers	Average Rooms per Customer	Absolute Maximum Kw.	Annual Kw.-Hr.	Annual Load Factor Per Cent	Kw. Load at Time of System Peak (Nov. 26, 1930)	Diversity Factor with Respect to System Peak	Load at Time of Residence Peak (Kw.)
A	Wed. Jan. 22, 1930	7:30–8:00 p.m.	180	4.0	57.6	163,240	32.4	36.0	1.60	54.0
B	Mon. Dec. 29, 1930	9:00–9:30 p.m.	35	3.9	11.4	27,821	27.9	7.8	1.46	9.2
C	Thur. Nov. 27, 1930	6:00–6:30 p.m.	24	5.3	8.1	18,411	27.3	5.0	1.62	5.7
D	Sat. Nov. 29, 1930	7:00–7:30 p.m.	77	4.1	19.2	39,000	23.3	10.8	1.78	15.6
E	Mon. Jan. 5, 1931	7:30–8:00 p.m.	21	5.9	11.3	22,819	23.2	7.4	1.53	9.9
F	Wed. Dec. 31, 1930	7:00–7:30 p.m.	50	5.1	16.3	32,085	22.5	11.7	1.39	15.3
G	Mon. Dec. 29, 1930	7:30–8:00 p.m.	15	8.3	11.4	21,560	21.7	6.6	1.73	11.4
*Mon. Dec. 29, 1930		7:30–8:00 p.m.	402	5.2	121.1	324,936	30.8	85.3	1.42	121.1

*Total coincident load and diversity factors.

Table IV—Residential-Day Use in Kilowatt-Hours for Group Studied

	Winter	Summer	Spring
Clear	213	181	183
Cloudy	314	212	239

rating being 150 watts and operating at 50 per cent load factor, 5,000,000 kw.-hr. would be required in the month of January. The total residence kilowatt-hours for January was 60,000,000. This indicated that refrigeration accounted for 8.3 per cent of the residence business in this particular month. In the month of January about 60 per cent of the total hours are darkness. Therefore, 60 per cent of the 8.3 per cent, or 4.9 per cent, would be the portion of the total residence kilowatt-hours used for appliances during the night accounted for by refrigerators.

The sum total of similar computations for all such appliances was eliminated from the kilowatt-hours of energy used at night and added to the daylight kilowatt-hours (with the exception of hall lighting). This gave the total appliance portion of the residence business, the balance being light. This is shown in monthly distribution for a year in Table II.

The conclusion is that energy sold to residence customers is divided approximately half for light and half for power over all the year, with the power portion running up to 59 per cent during the summer months. These computations are based on daylight saving between the last Sunday in April and the last Sunday in September.

It will be noted from Table III, showing load and diversity factors, that the individual group load factors are generally lower than for the group as a whole, while the diversity factors are generally higher. This is caused by the large differences between the types of residential customers in the survey, and quite naturally the diversity within the group lowers the coincident demand. The combined load factor of these various types of residential customers we believe to be a true index of the load factor for the total residential business of the company. The average day load between sunrise and sunset as determined from a large number of typical days is shown in Table IV. The particular features of the loads covered in the study analyzed by groups and by seasons are shown in the accompanying curves.

The facts and general information developed from this study of residence loads will be paralleled for retail commercial service by a study now in progress. The results of this later study will be available within a short time.

▼

Electric Pump Simplifies Lobster Storage

To prevent loss of lobsters from polluted water when held in the usual floating cribs prior to shipping them to market, George W. Dunn, Salem Willows, Mass., has installed shore storage tanks served by a 1-hp. motor-driven centrifugal pump having a capacity of 50 gal. per minute. Salt water is pumped into the tanks 24 hours per day. The water is drawn from the bottom of the harbor through a special strainer. The outside or principal tank can be emptied in twenty minutes through a 4-in. automatic discharge in case the electric service is temporarily interrupted and the crustaceans deprived of fresh aerated water.

The electric pump and tank layout enables the dealer to avoid the use of floating cribs, with frequent trips from shore to fill orders, and the installation has aroused much interest in the lobster trade of the Boston North Shore and the State Division of Fisheries and Game.

▼

Training Employees in Customer Contact

By ALBERT E. PETERSON*

Training Division, Industrial Relations Department, Commonwealth Edison Company, Chicago

In connection with customer contact training meetings with the employees of a utility company it has been found that perhaps one of the most successful devices for emphasizing the necessity of personalized service has been that of dramatizations. In order to be successful, these playlets must be life-like. The sources of the material, therefore, should be service sampling reports, letters of commendation and complaint, incidents reported directly to the complaint department, and occurrences that the employees will bring out in almost any type of discussion meeting.

The forerunners of these dramatizations are usually short presentations of contacts between an employee and a customer in which one person takes the part of a customer and the other that of the employee. These short presentations, of course, are used to emphasize such points as correct speech, information, politeness, interest in the customer, and appearance. After the dialogue the group before whom it is presented is asked to criticise and correct the discussion from the customer's viewpoint. When these short dramatizations are used, rating sheets are given to the group so that they will have something tangible to use in determining the relative merits of the employee's performance.

*Received January, 1932

After considerable success in the Commonwealth Edison Company with these shorter playlets it was decided to give the employees a complete picture of what the customer's reactions would be to different types of employee service. It has been found that in order to do this most satisfactorily individual departments should have dramatizations based on their own work. In each case it has been found advisable to have two types of playlets, one portraying a poor and the other a good contact with the customer.

In order to make the dramatization most effective, it has been found desirable to select participants from the department on which the dramatizations are based. Certain precautions will necessarily follow, namely, that while the people taking the parts of the characters in the good dramatization must necessarily be those giving good service, similarly those portraying the characters in the poor dramatization must also be chosen from the employees rendering good service, thus avoiding ridicule from fellow employees.

While the training man has supervised and helped to rehearse the players, the best success can be brought about by having some member of the supervisory force take direct charge of the rehearsals, as he can always arrange to have the participants present at the numerous rehearsals necessary for making the program a success. Before presenting the playlets, the chairman usually informs the gathering that while these playlets are based on actual happenings within the company, it has been necessary to emphasize the poor parts in order to give the dramatic flavor. At the same time he always informs the group that the players taking the parts of characters in the poor dramatization are, of course, some of the best people in the department.

The value of dramatizations has been repeatedly recognized. They are not only being used at the completion of each series of public contact meetings, but also in executive meetings and departmental gatherings to familiarize employees with different departments' special problems. There is good reason to feel that the setting of ideas into dramatic form can be applied equally successfully, either for training or for information-giving purposes.

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Built-in Lighting Units Serve Winchester Library

A completely unobstructed reading room is served by 112 60-watt lamps mounted behind opal glass panels in the new public library of this Massachusetts town. Reading room dimensions 41 ft. x 28 ft. x 16 ft. Footcandles on reading plane 12. Even diffusion, absence of shadows, and tables clear for users are notable features of the installation.

Energy Use Reveals Rising Industrial Activity

For the first time since 1927 the ELECTRICAL WORLD index of industrial activity, based on an analysis of reported energy consumption in various kinds of manufacturing plants, indicates an increase in October compared with the preceding month. The rise is small, only 0.5 per cent after the upward revision of the September index to include late returns, but it contrasts favorably with the nine-year average decline of 1 per cent and the decline last year of 3 per cent. It brings current activity within 13 per cent of last year's October, whereas the disparity was 16 per cent in September and 24 per cent in August.

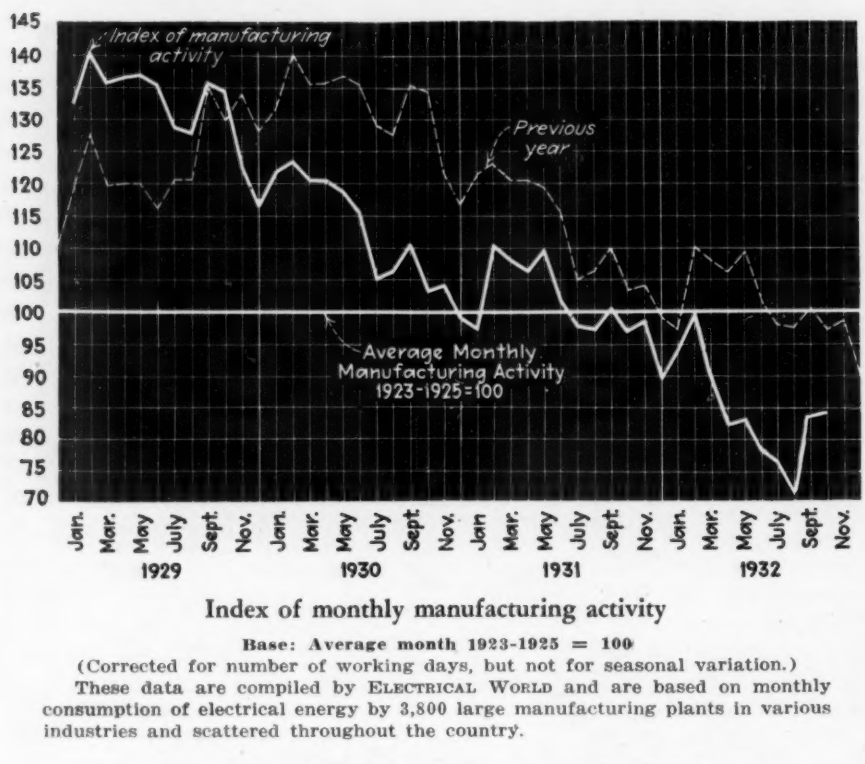
Individual groups reveal important movements which are not apparent when attention is confined to general averages. The most noteworthy one is the pronounced rise in textiles. The table shows only a part of it. Compared with July the gain exceeds 70 per cent. The industry has climbed out of the extraordinary valley of last summer up nearly to its level of 1931 and well above the rate of activity two years ago. While last month's increase was no more than seasonal, the three months' rise far exceeded the normal.

The leather products industry, too, has been trending upward; despite a mild setback during the past month it is 12 per cent above last year's level. Other groups now at or near the 1931 rate are forest products, paper and pulp and rubber.

Industries that are still low but that have made appreciable progress in recent months are iron and steel, up 23 per cent from August; metal working, up 15 per cent, and automobiles, 10 per cent.

In those reporting a decrease the changes are essentially seasonal, though in food products and the stone-clay-glass group they were somewhat greater than normal.

In each of the three geographical regions here tabulated the average for all industry made a second substantial advance. Certain recessions in the South and West, which tended to hold down the country-wide totals, will be discussed in next week's issue.

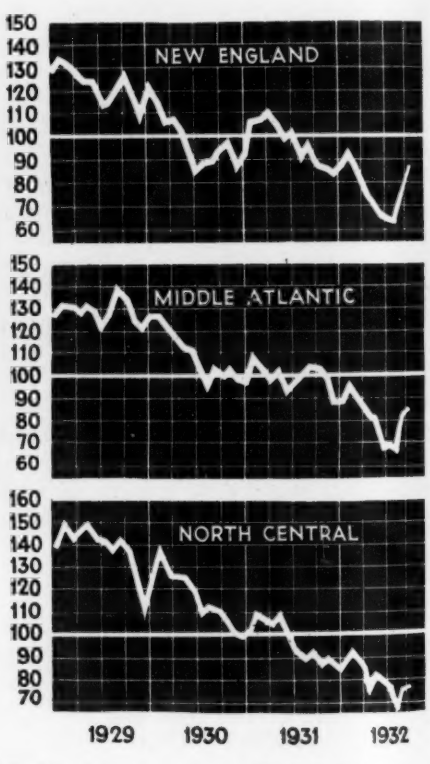

Index of manufacturing activity
Previous year
Average Monthly Manufacturing Activity 1923-1925=100
145 140 135 130 125 120 115 110 105 100 95 90 85 80 75 70
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1929 1930 1931 1932

Index of monthly manufacturing activity

Base: Average month 1923-1925 = 100

(Corrected for number of working days, but not for seasonal variation.)

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries and scattered throughout the country.



Industrial Group	United States Oct., 1932	United States Sept., 1932	United States Aug., 1932	United States Oct., 1931	New England Oct., 1932	New England Sept., 1932	New England Aug., 1932	New England Oct., 1931	Middle Atlantic Oct., 1932	Middle Atlantic Sept., 1932	Middle Atlantic Aug., 1932	Middle Atlantic Oct., 1931	North Central Oct., 1932	North Central Sept., 1932	North Central Aug., 1932	North Central Oct. 1931
All Industry	**84.4**	**84.0***	**73.5***	**97.1**	**89.6**	**80.5***	**67.7**	**87.5**	**85.0**	**83.8***	**68.4***	**103.3**	**76.1**	**74.8***	**66.8**	**87.4**
Automobile (including parts and accessories)	37.2	36.5	33.7	57.4	.....	.....	.....	.....	41.1	40.2	36.6	69.3	37.6	36.5*	33.6	50.1
Chemical products (including oil refining)	127.4	126.8	116.6*	142.0	150.0	134.0	121.8	186.0	131.8	132.1	123.5*	147.9	107.8	107.8*	99.0	118.9
Food products	120.7	129.5*	123.2	144.6	.....	.....	.....	.....	110.0	114.9	95.8*	118.0	129.1	129.0*	127.0	142.8
Iron and steel	54.2	50.6	44.0	76.3	100.3	91.3	79.8	114.5	41.3	40.0	33.1	73.0	58.5	53.2	47.7	75.5
Metal working	51.7	51.8*	45.0	71.0	78.6	68.7	54.4	87.3	49.8	50.2*	47.0*	68.7	45.6	46.1*	39.8	67.7
Metals group	52.6	51.3*	44.7	73.0	84.7	75.0	61.7	95.0	46.2	45.8*	41.0*	70.5	50.5	48.6*	42.8	70.7
Leather products	91.5	93.7	82.2	81.8	92.5	92.3	85.7	64.4	103.1	108.2	91.0	97.1	74.5	76.7	65.5	76.3
Forest products	87.5	80.6*	69.8*	87.2	45.6	42.0	37.1	40.4	48.9	45.4	52.2	69.5	80.9	85.6*	73.7	88.1
Paper and pulp	111.3	107.0*	94.7*	113.0	117.8	110.5	98.3	111.2	66.3	68.7*	62.5*	93.6	112.2	103.7	92.7	102.0*
Rubber	82.9	87.7	76.4	82.8	105.4	96.8	72.5	65.0	.....	.....	.....	.....	77.0	83.3	74.8	89.4
Shipbuilding	75.7	84.0	77.9	84.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stone, clay and glass	83.4	90.3*	71.8	113.4	.....	.....	.....	.....	66.7	70.6*	53.6	95.5	108.3	109.3*	84.0	104.1
Textiles	93.2	86.7*	65.7	98.2	78.0	67.5*	53.8	70.0	118.8	111.0*	73.5	135.3	116.3	104.2*	84.5	130.4

*Revision.

Sifting Power Prospects

By DEAN TAYLOR*
Utility Management Corporation, New York City

A COMMODITY or service that is not bought "off the shelf," but must be "sold" demands a prospect list. Central-station service must still be sold—large purchased power service is not yet in the staple commodity class, is not "demanded" by industry, has not yet achieved universal "consumer acceptance," and for these reasons the power salesman must have a prospect list and a complete one. More than half the industrial power of this country is still produced in private plants. This is a challenge to those successful but complacent sales managers who tell you their company has all the power business to be had; that is, all they feel they are entitled to. And that suggests the question, When is a prospect?

Power companies are purveyors of energy. Service of one kind or another is involved with the sale of power, but in the last analysis energy is the thing purchased from the company. Therefore, any concern using energy is a prospect for central-station power. Industrial concerns most often use energy in the form of power, light or heat. Few industries are using the maximum amount of electrical energy that they could profitably use and still fewer are purchasing all the energy they could profitably purchase. It follows that every customer of a power company is a prospect for at least some additional electric power, light or heat, and every concern producing any power, light or heat is a potential customer and therefore a prospect.

The trouble with too many power salesmen is that they do not include all the potential power users as prospects. They neglect to do this for a number of reasons, among which are:

Failure to recognize possible applications of power, light or heat.

Failure to determine the actual economies of additional applications or the economies of purchased power vs. generated power.

Failure to keep an eye on future developments while busy with every-day problems.

Failure to admit that a power company has an obligation to attempt to serve all the energy requirements in its community.

Failure to realize the value of a prospect list as a running record of progress and a measure of performance.

Failure to make the effort to determine who and where the prospects are.

A prospect list should be both comprehensive and selective. No potential customer should be omitted, but prospects should be analyzed, and classified according to the uses of power and according to the relative chances for immediate sale. This classification is not for the purpose of concentrating solely on the likely prospects, but rather for the purpose of planning one's sales activity over a year, allotting some time to the "hard nuts" and nursing them along while giving more frequent attention to the "hot" prospects. There is scarcely a customer who cannot be shown some small additional use for electric power and many customers appreciate having these opportunities pointed out to them. But it means work and study and time spent out in the prospect's plant to develop new uses for electricity. A plant manager may be too close to the job to see all the opportunities there are for making profitable use of electricity for light, heat and power.

The power salesman should have enough ambition, imagination and interest in promoting his own product to find new uses for it in nearly every customer's plant. The best prospect lists are made out on the job and not in the office.

The prospect list should be a summary of individual survey sheets made up for each prospect. One type of power survey sheet is shown in Table I. Some salesmen use the survey sheets themselves as the prospect list, but there are real advantages in having all the prospects brought together on one list. Individual survey sheets or cards are useful when working on particular prospects, but if in addition to the individual sheets all prospects are shown on one list, a better picture of the salesman's field is presented and the list can be used as a working sheet by the power sales manager and can serve as a record of performance if notations of progress on specific jobs are made from time to time. A prospect list, kept alive and up to date, can be used as a substitute for voluminous reports on the status of power sales and at a fraction of the effort and cost. A prospect list can be revised without necessarily making new and complete surveys of a prospect's plant and should be revised at least every six months.

The sales manager's check-up

The sales manager can use an up-to-date prospect list as a means of measuring the kind of effort put forth by the salesmen. Monthly sales reports of new business signed by the salesmen may be impressive, but if the names of at least some of these new customers cannot be found on the prospect list one of two things may have happened—either some prospects have been overlooked in making the original survey or these new customers have simply "appeared on the scene" for reasons beyond the control of the salesmen. Some power salesmen are inclined to take full credit for the power load of new

Subjects Covered in This Series

Retaining Existing Customers.†
Sifting Power Prospects.
Meeting Diesel Competition.
Where to Begin Sales Approach.
Process Steam — an Opportunity.
Making Power Reports Effective.
Payment-Out-of Savings Engine Contracts.
When the Odds Are Against You.
Yardsticks for Power Sales.
Power Sales Management.

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†Published October 22, 1932.

enterprises, even though they have had nothing to do with promoting the new industry or application. Power salesmen should be on the lookout for new industries and should help in any work to attract new power users to the company's territory.

But the surest measure of a salesman's ability to sell power is the degree to which he develops business among his prospects, either by shutting down private plants or adding new uses for power in existing customers' plants. A very sizable percentage of new power business added each year should come from the prospect list. If it does not, these prospects are being neglected and more effort by the salesman or more salesmen are needed.

Beware of the boast of achievement by a salesman who

Table I—Information to Be Included in Power Survey

Name of Company —— Individual —— Nature of business —— Probable annual power cost —— Probable annual cost of purchased power —— Load factor (approx.) —— Demand —— Rate schedule —— Credit rating —— Cost of power plant —— Distance from our lines —— Voltage nearest point —— Attitude toward purchasing power

Present Equipment

Number of boilers —— Size —— Make and type —— Hp. —— Type and condition of boiler settings —— Grates —— Draft —— Source of water —— Gallons of water per day —— Steam pressure used —— Maximum allowed —— Tons coal used per day —— Kind —— Is coal hauled and wheeled? —— Cost per ton —— Ash disposal —— Number of firemen (24 hours) —— Engineers —— Is feed water treated? —— How? —— Cost per day —— Feed water heaters Type —— Temperature of water ——

Engines

Size —— Make —— Rated H.P. —— Condenser (?) —— Drive —— Oil, Gas Engine or water wheel —— Size —— Hp. —— Are engines direct connected? —— Length of line shaft ——

Generators

Make —— A.c. or d.c. —— Voltage —— Kw. ——

Present electric load

Is steam used in process? —— Amount or pipe size —— Pressure —— How is building heated? —— Cu.ft. —— Type building ——

Oil, coke or gas, melting or treating

Quantity of product made per day with above heat? —— Temperature limits permissible ——° to ——° Minutes per heat —— Pounds per heat ——

Size and type lighting units used

Approximate spacing —— Height —— Remarks: —— Survey made by —— Date——

Table III—Information to Be Included in Industrial Heating Survey

District —— Name —— Address —— Business —— Purchased power —Load —— Hp. —— Kind of service furnished —— Volts —— Phase —— Cycle —— Schedule —— Average rate per kw.-hr. —— Cents ——

Description of Industrial Heating Equipment

Type of equipment used —— Kind of fuel used —— Quantity per month —— Unit price —— Kind of fuel used —— Quantity per month —— Unit price —— Material heat treated —— Unit cost —— Temperature, maximum —— Average —— Pounds of product, per hour —— Per month —— Hours of operation per day —— Per month —— Remarks —— Data obtained from —— by —— Date ——

Table IV—A Method of Recording Data on Existing Applications

Plant	Dodge Brothers, Inc.
Product	Automobiles
Work done	Carbonizing
Equipment	Two (2) rotary furnaces
Size	Over-all diameter 26 ft. 3 in. Over-all height 13 ft. 3 in. incl. foundations 18 ft. 10 in
Insulation	9-in. fire-brick, 12-in. "Silocell"
Ventilation	None
Electrical equipment	5 100-kva. three-phase, 220-volt circuits per furnace
Pyrometer	3 L & N recording controllers operating contactors and relays on each furnace.
Temperature	1,700 deg. F.
Time	Time to bring furnace from 78 deg. to 1,700 deg. — 6 hours Time to carbonize — 17 to 20 hours
Load	225 boxes at 125 lb. per box (14 tons). Load double decked
Pounds per kw.-hr.	4.36 lb. of work per kw.-hr.
Previous heating process	oil furnaces
Cost of operating, compared with previous heating method	Saving of 6 cents per box over old method
Reasons why installed	Uniformity of case. Ability to carbonize on a definite time cycle without sampling. Improved working conditions. Reduction of labor cost, increased life of carbonizing boxes
Opinion of installation from user's standpoint	Very satisfactory
Opinion of installation from central-tion standpoint	Good load
Source of data.	

Table II—How Information on Prospects May Be Listed

District ..... Date of Latest Revision ..... 193..

Name and Location	Nature of Business	Connected Load Kw. — Present	Connected Load Kw. — Prospective	Estimated Annual Revenue	Assigned To	Present Status and Remarks.
American Product Co.	Building Material	15 kw. aux.	300	$9,000	Riley	Report under way. Prospects fair for 1932.
115 Beaver Street		10 kw. ltg.	15 htg.	600		
Barter Feed Mill	Feed	Lighting	10	200	White	Dependent on line extension.
Bartlett, Hollis	Woodworking		55	1,250	White	Not immediate prospect.
Eastern Pulpwood Co.	Hoists		75	1,000	Jones	Problematical. Will not invest in new electric hoists. Might lease equipment. (Manager away).

Table V—Industrial Heating Prospect Data May Be Tabulated Thus

District ..... Date of Latest Revision ..... 193..

Name and Address	Nature of Business	Heating Load—Kw.		Estimated Annual Revenue	Remarks
Eastern Mfg. Co.	Foundry	Air furnace	15	$ 450	Immediate prospect.
		Lead pot	90	3,000	Dependent on new product.
		Gray iron furnace	300	8,000	Dependent on volume of small castings.
Northern Valve Mfg. Co.	Valve foundry	Core baking	300	3,000	Gas a serious competition.
		Baking oven	15	180	With good volume of business.
		Gray iron furnace	500	10,000	Not for present.
		Nitriding furnace	10	240	In near future.
State Mfg. Co.	Glass bottles	Lehrs	100	150	Requires thorough study.

keeps no active prospect list. You may be reasonably sure he is taking business as it comes and is not creating business.

There are many ways in which information on prospects may be listed. The form shown in Table II is one arrangement that has been found useful for showing status of prospects for power. This list should include all present customers who may be prospects for additional loads as well as prospects who are buying no power at present. The list should also include heating prospects, although separate survey sheets are used for electric heating and lighting. In many cases it is desirable to have separate prospect lists for heating and for lighting as these prospects are frequently handled by specialists, but all of these prospective loads can well be consolidated on one prospect list for the use of the industrial sales manager.

A sample industrial heating survey sheet, a data sheet on an existing application and an example of an industrial heating prospect list are shown on the opposite page.

Commercial cooking and baking prospects and commercial and industrial lighting may be listed similarly. No one particular form of listing is necessary, but enough information should be shown to indicate not only the extent of the potential load but the status of negotiations and the relative likelihood of obtaining the business within the current year.

Keep your prospect list alive and you will keep your job alive.

▼ ▼ ▼

New Practice Saves Poles Threatened by Termites

By M. M. BRIDGWATER

General Superintendent Arizona Power Company, Phoenix, Ariz.

Termites, discovered in an area previously thought to be free from this pest because several untreated pole lines therein had given more than twenty years service with no sign of infection, recently attacked a 45-kv. line of the Arizona Power Company. As the infection had progressed to such a point as to cause several pole failures with consequent service interruptions, remedial measures were imperative.

The conventional method of stubbing could not be used because of the danger of a continued attack by the termites on the pole remaining in the ground, and it was decided to supplement ordinary practice with additional preventive measures.

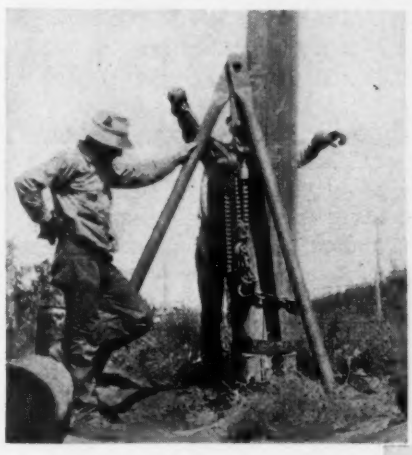
Preliminary operations in the stubbing process consisted of attaching two rope guys to a point just below the braces and bull points driven into the ground at right angles to the line and digging a hole on one side of the pole to about three-quarters of its depth. The pole was then sawed off a few inches above the ground line. With a 1½-3-ton hoist mounted on a tripod constructed from 2-in. pipe the pole was raised several inches and the infected stub removed by tipping it into the hole previously prepared.

The pole is then lowered into a tub of hot creosote placed on a timber spanning the hole. Creosote is heated on the job by means of a common blow torch, the pole remaining in the bath while the hole is being prepared to receive a treated stub. This stub is Southern yellow pine which has been given a full pressure treatment having an 8-lb. final retention. This stub is set into the newly prepared hole alongside the pole.

Where no obstructions exist, such as fences, rocks, etc., the tripod holds the weight of the pole while the stub is banded to it. Otherwise the tripod hoist lifts the pole out of the bath, setting it on the timber during the banding operation.

By placing a flat rock under the pole its base is prevented from resting on the ground. This forestalls the collection of moisture under the pole, a condition which would promote an efficient breeding place for termites with the contingent possibility of future infection. This could happen if the creosote treatment proved ineffective or if the pole should check at its base and permit an avenue of entrance for the termites.

This method of maintenance has proved to be extremely effective and practical. It permits repairs at a reasonable cost and without taking the line out of service.



Hoisting a pole which has been sawed from its infected stub

Preparatory to dipping the base and banding to a treated stub lying in the foreground.

Pole dipped into tub of hot creosote while treated stub is placed

The completed operation

The pole and treated stub are banded together with the base of the former resting on a flat rock to prevent future infection.

Probable Applications of Gaseous-Tube Lighting

By WARD HARRISON
Dirctor of Engineering General Electric Company, Nela Park Engineering Department

FACTS and rumors about new illuminants have not for a quarter of a century enjoyed the popularity that is accorded to them today. One speaker was quoted from coast to coast for boldly proclaiming the passing of all of our present lights in favor of a new "artificial daylight" which had just been revealed to him in the "private laboratory of a friend." Investigation seems to indicate that this particular artificial daylight is our old friend the carbon-dioxide tube, originally developed 30 years ago by D. McFarlane Moore. It does give artificial daylight, but its serious handicap is that its efficiency is about one-fifth that of ordinary light sources.

The subject has many angles and not a few men in the industry are seriously concerned over the position of public utilities in view of new developments which it is claimed will give the householder "all the light he can use, for a fraction of his present current consumption."

Most of the present interest in new illuminants centers about some form of gaseous conductor—"neon tubes," as they are popularly but often inaccurately termed. The success of these tubes in the advertising field has been spectacular and each year more and more is being learned* about them and the possibility of their application to other fields as well.

The writer of the present article has been asked to discuss not so much the characteristics of the new types of lamps themselves but rather the probable status of these lamps in the field—that is, the extent to which gaseous conductors are likely to affect our general lighting practice and also our dollars expenditure for kilowatt-hours. We may well preface such a discussion with the almost axiomatic proposition that, excepting a few specialized cases, light sources are employed for one of two principal purposes: (1) to illuminate other objects, or (2) to be seen, as in a signal or an advertisement. The requirements of these two services are radically different and many qualities that are advantageous in the one may prove handicaps in the second. To use a homely illustration, the sun is our best illuminant, but it is ordinarily a mighty poor thing to look at; conversely, the rainbow has infinitely less value as an illuminant than as a spectacle.

The 5,000- to 15,000-volt low-current neon and mercury tubes with which we are so familiar in electric signs are all in Group 2—light sources to be seen. The fact is overlooked by many that as illuminants these low-wattage tubes are less efficient than ordinary incandescent lamps, and markedly less than the mercury tubes. It is the long, slender, luminous sources generating a colored light and not efficiency, *per se,* which makes the gaseous tube valuable as an advertising medium. Practically all the development work on gaseous tubes as general illuminants is being done on lamps designed to operate at 220 volts or lower.

Essential Qualities of Illuminants for General Application—Where light sources are chosen to fulfill the requirements of Group 1—to illuminate other objects—experience has shown that for permanent satisfaction they must possess the following characteristics: High efficiency of light production, simplicity of operation, moderate first cost, availability in a range of sizes (including low wattages) reasonably acceptable color.

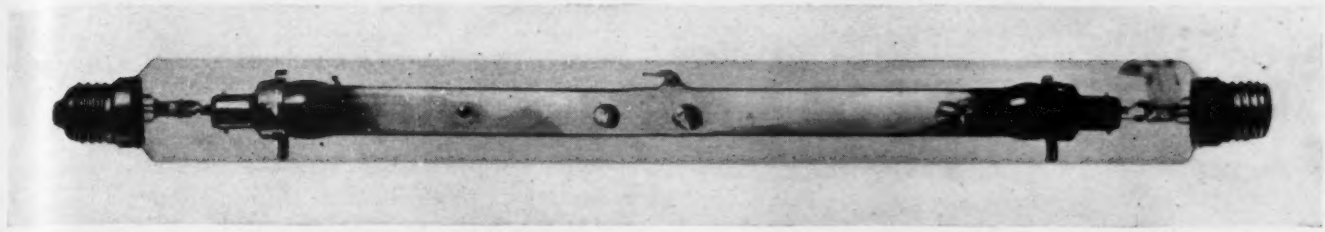
If any of these qualities are lacking, the field of application of the lamp is much limited. An excellent illustration of this fact is found in the flame-arc lamps of two decades ago. It was claimed for these lamps that they would give 3,000 cp. for 500 watts, a higher efficiency than has even been attributed to the new gaseous sources of today, yet there are now hardly any flame-arc lamps in use in America. They lacked some of the other essential qualities listed above.

From the standpoint of simplicity, low first cost and availability in various sizes, the 110- or 220-volt gaseous-tube sources are at a disadvantage in comparison with "Mazda" lamps. Therefore where tube sources do supplant our existing illuminants for general utility lighting it will probably be on the basis of more acceptable color or higher efficiency or both. In some cases it is reasonable to expect that the dimensions of the tube will give it an advantage in built-in lighting installations.

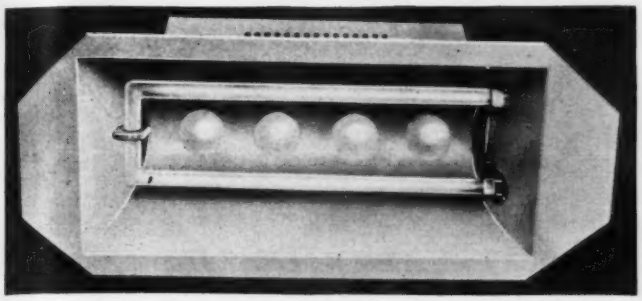
Sodium Lamps—Of the various tube sources now in the course of development, the one employing sodium vapor as the light source appears to be the most promising from the efficiency standpoint. Efficiencies of from 50 to 70 lumens per watt are indicated in sizes of 300 to 500 watts. Sodium lamps can be made in smaller sizes; in fact, the original 130-watt lamp developed by Dr. Pirani in the Osram laboratories in Berlin showed an over-all efficiency as high as 35 lumens per watt. Other lamps have been made in the 25-watt size. It does not appear, however, that the efficiency of sodium lamps will offset their inherent high cost except in sizes of 100 watts or more.

The high cost of the sodium lamp is due, first, to the necessity of using in its construction glass which will resist the attack of the very active sodium vapor which it is intended to confine and, second, to the fact that the

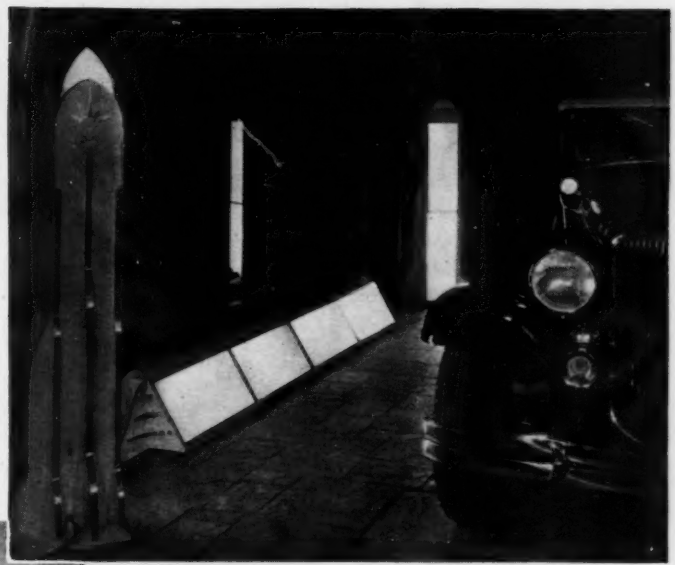
**For an excellent discussion of the efficiency and operating characteristics of such lamps developed both here and in European laboratories the reader is referred to an article by R. D. Mailey, vice-president General Electric Vapor Lamp Company, in* ELECTRICAL WORLD *for July 9, 1932.*



A 20-in., 130-watt sodium lamp giving 30 lumens per watt
(Courtesy Osram Co., Berlin)

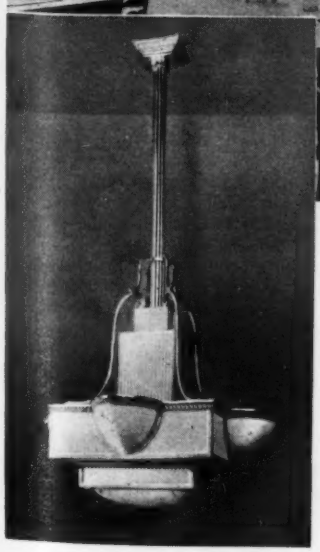


Industrial unit for approximate daylight. Embodies a mercury vapor tube and four incandescent lamps. Fixture is viewed from below
(Courtesy General Electric Vapor Lamp Co.)

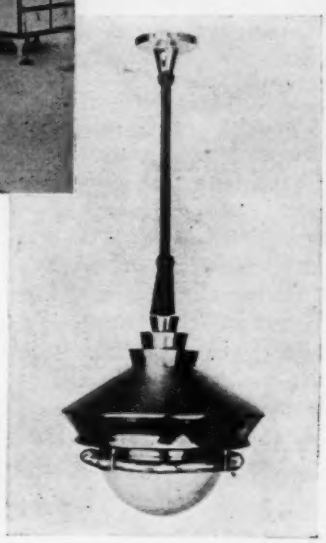


Mercury and neon tubes behind frosted glass produce white light, but appear colored. The white-light illumination emphasizes the chromium finish on automobile and shows car colors in true value, while lighting panels, due to two colors, provide decorative effect

A combination mercury and neon unit
(Courtesy Canadian Neon Company)



Fixtures house combination of mercury-vapor and incandescent lamps in showroom of Philadelphia Gas Company. Lighting designed by A. A. Brainerd, Philadelphia Electric Company



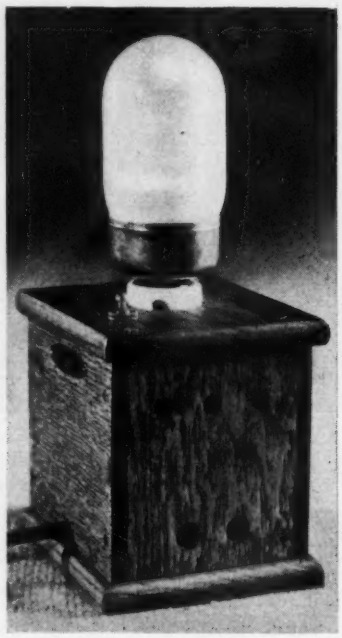
Experimental fixture giving approximately white light. Hot-cathode mercury tube surrounds hemisphere containing incandescent lamps
(Courtesy Osram Co., Berlin)

Sodium lamp used on trial highway lighting installation in Holland. Note vacuum bell serving as outer globe

completed sodium lamp must be inclosed in a second bulb or tube and the space between the two evacuated, at least in the smaller sizes, to prevent the escape of heat. Without this heat insulation sodium vapor will condense and the operation of the lamp will not be satisfactory.

The warm yellow light of a sodium lamp makes it pleasant to look at, but its great disadvantage is the almost completely monochromatic character of this radiation which renders color discrimination impossible and which is actually less flattering to the human countenance than mercury-vapor light. In utilitarian street lighting, however, this disadvantage is of lesser moment than in almost any other field. Street lighting may therefore become a logical outlet for the sodium lamp.

An experimental highway installation† made by the Phillips Company in Holland has just been reported upon favorably. The lamps, consuming 100 watts each, were operated in series on a 5-amp. direct current and in this way ballast losses were minimized. The lamps gave approximately 500 cp. and were located on a staggered spacing average of 85 ft. apart as measured along the center line of the road. In addition to the high efficiency of light production, it is claimed for this type of installation that the monochromatic character of the light greatly assists vision at the low intensities which obtain out of doors. Streets and highways, without question, comprise the field in every country where better light is most sorely needed.



A 25-watt sodium lamp with auxiliary reactance. It develops 20 lumens per watt and is under development by incandescent lamp manufacturers

Sodium lamps will also undoubtedly prove valuable in chemical laboratories where monochromatic light is required for various forms of analytical work. On account of their color characteristics sodium lamps are not suitable for commercial or home use.

Mercury and Neon Tubes—For general lighting with gaseous-conductor tubes we must depend primarily on the green mercury or the red neon lamps or a combination of the two. These elements and sodium are so far the only gases that have been made to generate light at reasonable efficiencies. In the Osram laboratory I have seen 1,000-watt high-pressure mercury tubes which operate on 220 volts and produce about 40,000 lumens; in other words, nearly four candles per watt. The lamps are self-starting without the aid of high voltage and require no auxiliary except a ballast reactance. When these lamps reach the commercial stage it would appear that they will have a logical application in the lighting of large areas, probably in conjunction with other illuminants. The lamps require about ten minutes to come up to full brilliancy and if the current is momentarily interrupted the lamps must cool down for a similar period before they will light again.

Like all arc lamps the efficiency of these tube sources becomes very much lower as the wattage is reduced. In 300 to 500 watts the efficiency of 16 to 18 lumens per watt attainable for mercury or neon is not higher than for the older Cooper-Hewitt lamp nor for the corresponding sizes of incandescent lamps. On the other hand, in these smaller sizes much less time is required to heat up and cool off. Also, in any tube in which a high-voltage "kick" is provided for starting, there is no delay in relighting after the current has been temporarily interrupted. In ratings of 100 to 150 watts mercury and neon tubes are not more than one-half as efficient as incandescent lamps.

Daylight Color—Many claims have recently been made for high efficiency "daylight" tubes, but the only known gas which will give a really white light is carbon dioxide, previously mentioned. The efficiency of carbon-dioxide tubes is still about 2½ lumens per watt, with little prospect of improving this figure.

Mr. Mailey's article‡ discussed the combination of a neon tube and a mercury tube in the proper ratio of length to secure an approximation of white light, an approximation which is acceptable for many purposes, although not for exact color matching because some parts of the spectrum are entirely lacking. The efficiency of this combination is 17 to 18 lumens per watt. Almost identically the same color of light, but without a gap in the spectrum, is obtainable at the same lumens per watt from a combination of a mercury tube and one or more incandescent lamps. In this combination either the hot-cathode mercury or the familiar Cooper-Hewitt tube may be used.

If the latter type of unit is chosen then this combination, while apparently giving a new result, involves no illuminants other than those whose satisfactory operating characteristics have been established over many years.

It is of interest to know that the first combination of mercury-vapor tubes and incandescent lamps for the purpose of securing white light was installed in the editorial offices of the New York *World*. More than 25 years have elapsed since that time, but the question of optimum color of light seems just as far from being disposed of as it was then.

There are locations where white light is decidedly advantageous, but the fact remains that although daylight tungsten filament lamps have been available for many years and at very reasonable prices, and although they have frequently been campaigned by the manufacturers, 98 per cent of the total lamp demand is still for the ordinary uncolored bulb, which gives a much warmer tone. In other words, whiteness is not a quality for which the public will pay any great premium, nor is there much convincing scientific data to support the claim that it is worth a greater price. It is generally accepted, however, that "white light mixes better with daylight." Much is being said of daylight units for show windows, but in the past the almost uniform verdict of merchants has been in favor of a warmer, more inviting color of light. A conspicuous exception is in the case of automobile display

†*See "Electrical World," page 233, August 20, 1932, and page 374, September 17, 1932.*

‡*See footnote on page 694.*

windows; chromium and nickel trim and metallic body finishes show up to much better advantage under white light.

Colored Light—When red or green light is required from incandescent lamps the result is obtainable by the use of a red or green colored material on or in the bulb, which absorbs all colors except the one wanted, and in so doing usually absorbs upward of 90 per cent of the light. For yellow the absorption is about 30 per cent. In other words, colored light from incandescent lamps is obtained by the subtractive method and for certain colors at a tremendous sacrifice in efficiency. In a neon or mercury tube the full efficiency of the source is utilized in producing colored light, and this appears to be one of the most promising fields of application. Fortunately, it is a broadening field as light is accepted more and more as a decorative medium. Research on plant growth likewise indicates that colored light may find a valuable application here in a practically untouched field so far as the previous use of electricity is concerned.

Important Assets of Gaseous Tubes—In the opinion of the writer, mercury and neon tubes have two great advantages, and timely ones, which will result in the considerable use of these sources in commercial interiors, particularly theaters, restaurants, office buildings, lobbies, smart shops, etc. The first of these advantages is that the line source of light adapts itself well to modern architecture, and from this standpoint will meet the very general approval of architects and interior decorators. The second is that human beings like colored *lights*, although they do not care particularly for colored *illumination*. Where mercury and neon are inclosed together in a frosted tube of large diameter one is conscious of the soft glow of two colors when viewing the fixture, but the resultant illumination is not colored. In such installations the wattage required is very much less than for a comparable installation of incandescent lamps. On the other hand, the energy consumption will probably be substantially greater than that of some more strictly utilitarian installation previously used.

Combinations of mercury tubes and incandescent lamps (tubular in form where desired) possess many of the qualities which have just been discussed. Like the combination of mercury and neon, they offer many interesting possibilities for artificial skylights and similar "built-in" systems.

Résumé—The typical electric lamp used in this country has an average size of a little more than 60 watts. Considerably more than half of all the money spent for electricity today is for lighting, and by means of such lamps. As converters of electricity into light these lamps are less than 10 per cent efficient. Therefore it is readily conceivable, and in fact it is only reasonable to believe, that they will some time be replaced by other and more efficient converters. On the other hand, there is not at the present time the slightest reliable evidence that such a lamp has been discovered or even that its discovery is closer at hand than it appeared to be ten years ago.

The developments which have recently been made in new illuminants, and they are very considerable developments, have practically all been in the direction of supplying specialized fields, fields which for the most part could be but partially developed with previously existing illuminants.

Italy Increases Electrical Development

From 7,500,000,000 kw.-hr. in 1925 the total output of electricity in Italy increased to 11,000,000,000 kw.-hr. in 1931. Compared with the latter there are from 20,000,000,000 to 30,000,000,000 kw.-hr. which can be obtained annually from Italian hydraulic resources. At 0.7 kg. (1.5 lb.) per kilowatt-hour this corresponds to the consumption of about 10,000,000 tons of coal annually, which is equivalent to the country's present annual consumption.

Since Italy occupies the fourteenth or fifteenth place among European countries in respect to hydraulic resources per capita and lacks coal it is evident that those resources must be utilized to best advantage.

As a solution of the problem it has been proposed to construct large high-tension lines whereby the power could be distributed over a wide area, but such a step will not give satisfactory results unless coupled with the construction of hydraulic storage stations.

Meanwhile the low production cost of steam-generated electricity has greatly reduced the advantage of constructing large reservoirs. Seasonal deficiencies at certain hydraulic stations had to be met by the construction of reserve steam stations. For instance a steam station at Marghera (Venice) covers the seasonal lack of water in the Alpine hydro-electric plants.

The general policy, however, of leading Italian electric companies has been to stop enlarging their plants until the demand increases, especially since it is impossible, during the present economic depression, to establish the relative advantages of constructing hydro-electric, compared with steam stations.

Important factors that may lead to an increase in consumption are: (1) Electrification of the Italian railways. (2) the progress of electrochemical industry, favored by the government with a view to freeing the country from the necessity of importing chemical fertilizers, and (3) the progress agricultural electrification purposes.

As to the first named, it is known that the government has recently decided to start the electrification of an additional 5,000 km. (3,000 miles), while a report of the Terni, Società di Elettricità, points out the new developments of the electrochemical industry, particularly in central Italy.

As to rural electrification, the number of electric plants for irrigation has practically doubled in the last four years, as appears from the following figures:

	1928	1931
No. of plants	8,984	18,633
Power installed, kw.	34,964	66,527
Energy used, kw.-hr.	34,595,348	53,047,037

While many electrical engineers are not very enthusiastic about the possibility of applying electricity on a large scale in agriculture, claiming that rates demanded by the farmers are too low, certain industrial leaders, like Giacinto Motta of the Edison Electric of Milan have recently pointed out that the electrification of agriculture is affected not so much by the price of electricity as by the cost of the necessary equipment.

Therefore, although the opportunities for increasing the consumption of electricity in Italy are rather large,

judgment as to the rational development of existing hydro-electric plants and of those yet to be built must be deferred until the present economic crisis has passed.

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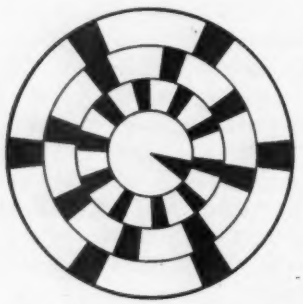
Improved Method for Finding Induction Motor Slip

By C. M. WALLIS

Instructor Electrical Engineering, University of Missouri

Refinement of the usual stroboscopic method for finding the slip of an induction motor greatly enlarges the range and accuracy of slip determination. The usual set-up consists of a neon light connected to the motor terminals and, attached to the end of the motor shaft, a black disk with equally spaced white sectors, equal in number to the motor poles. This revolving disk, when illuminated by the neon light, appears to rotate backward at a speed equal to the motor slip. At high values of slip, however, it becomes difficult to count the apparent revolutions of the disk. Practically an apparent disk speed of 90 r.p.m. is the approximate limit of accurate observation.



Disk for determining slip

The improved method permits accurate determination of slip to any desired limit. It requires a synchronous motor, connected to the same power source as the induction motor, carrying one or more contacts on its shaft by means of which the neon tube light receives one voltage impulse for each revolution of the field of the induction motor whose speed is to be observed. The disk fixed to the induction motor shaft has several bands of sectors on it, as illustrated. The particular arrangement shown is for a four-pole machine.

All sectors will appear stationary when the disk rotates at synchronous speed. As the motor slip is increased from zero value the sectors will appear to revolve backward, the revolutions of the center sector being determinable up to 8 per cent slip. The band containing ten sectors will appear to rotate backward until the sectors blur into a continuous white band. As the slip further increases the blur resolves itself into a band of ten distinct sectors rotating forward at decreasing speed until it becomes stationary at 10 per cent slip or 90 per cent synchronous speed. This performance continues as the motor speed decreases, the band becoming stationary at per cents of slip in multiples of ten. The same phenomena appear with the other bands on the disk in sequences according to the different number of sectors contained in them. In the eight-sector band the stationary intervals are $12\frac{1}{2}$ per cent apart; in the six sector, $16\frac{2}{3}$ per cent. Thus this method provides clearly visible points of slip determination between which apparent speeds and directions of band rotation are easily observed. Observation on the various bands can be checked against each other to insure accuracy.

The actual speed of the induction motor is obtained from the formula:

$$\text{Motor speed} = \frac{(\text{Syn. speed})\ (a\text{-}k)}{a} \pm N_a$$

a = number of sectors in band observed
k = integer corresponding to number of times sectors have appeared stationary as slip increases from zero (excluding stationary appearances at zero slip)
N_a = speed of apparent sector rotation, plus if forward with respect to disk rotation, minus if backward.

R.p.m. at Which Various Sector Bands Appear Stationary

The table gives the motor speeds in revolutions per minute at which the various bands will appear stationary and their approximate readable ranges down to 50 per cent slip. At motor speeds outside these ranges the band shadow is confused and the sectors are indiscernible.

1-sector band	Readable range	.....	1,800—1,650	.....	.....
1-sector band	Readable range		1,660—1,580	1,480—1,390	1,310—1,220
	Stationary	1,800	1,620	1,440	1,260
8-sector band	Readable range		1,610—1,530	1,390—1,310	1,175—1,080
	Stationary	1,800	1,575	1,350	1,125
6-sector band	Readable range		1,540—1,460	1,240—1,160	940— 860
	Stationary	1,800	1,500	1,200	900

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So-Called "Low-Cost" Lines*

From time to time statements are made indicating that rural lines can be built for substantially less than the costs quoted in the preceding articles on cost of rural lines. Whenever possible these statements should be carefully analyzed. Such analysis may develop valuable suggestions, or it may be found that the statements are based on incomplete cost figures, that they relate to mere general estimates, without reference to conditions encountered in the field, or that the circumstances are so unusual that comparisons are meaningless.

The foregoing discussion of factors affecting costs suggests that the following queries may properly be applied to statements indicating exceptionally low costs:

1. Do the figures refer to the so-called heavy, medium or light loading area?
2. Do the specifications comply with the National Electrical Safety Code?
3. Do they include provisions for additional loading, both mechanical and electrical?
4. Do the figures relate to one particular line built under the ideal conditions as to terrain, location of customers, right-of-way, weather, etc., or do they represent average conditions?
5. Do the figures include cost of secondaries where they are along the line paralleling the primary circuit?
6. Do they include overhead costs, and if so, what items?
7. Is the line located in timber country where suitable poles can be secured at low cost?
8. Are all labor costs included?
9. Are they actual cost figures or estimates?

**Third installment of report of electric technical committee on construction standards and cost of rural distribution lines, Empire State Gas and Electric Association. See "Electrical World," October 8, page 507; October 15, page 526.*

Power Station Cost Control as Affected by Design

By C. D. ZIMMERMAN

Assistant Superintendent of Production
Ohio Edison Company, Akron, Ohio

Simplicity of plant layout, proper advantage taken of steam bleeding and adequate recognition of characteristics of fuel supply are essential to arrive at best station economy.

CONTINUOUS production of electricity for the smallest total of fixed and operating costs for a given location and with due regard to forecastable trends is the object of design in a generating station. Cost control naturally starts with design. There are certain definite aspects of design that for best operating results should never be lost sight of. One is that simplicity must be attained without sacrifice of significant advances in the art and the other is that proper consideration be given to type or types of fuel available.

Costs exclusive of fuel (as well as fuel costs) are largely fixed by design and very roughly with the number of single main units and number of auxiliaries, pumps, fans, heaters, etc., per unit. Maintenance costs also vary with the number of units and auxiliaries, but to a greater extent on whether the plant functions as designed or if frequent outages (usually boiler) are necessary for repairs. One of the accompanying graphs shows an approximation of the effect of the size of single units (or single sections of compound units) on production costs exclusive of fuel for average plant conditions.

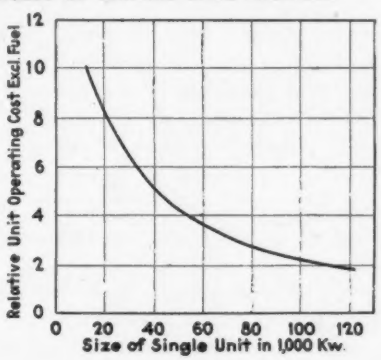
The intangible effect on production costs of simplicity in design is surprisingly large and it is felt that this factor has not always received proper weight. A minimum number of auxiliaries of a standardized type, minimum piping, a minimum number of floor levels, an uncrowded layout and the employment of only those fuel-saving devices which result in relatively large financial returns are important features of simplification. A standardized type of design for each unit is seldom economical due to rapid advances in the art, but the value of simplicity and standardization should be carefully considered in deciding on changes.

Although records show that the simple and conservative design is not a guarantee of good results, in general it is found that this type of plant starts smoothly, has few "growing pains" and operates relatively close to predetermined results, whereas many complicated plants having more or less radical features have had many difficulties and require a number of years to bring them into line with what is expected of them. In general, the operating efficiency ratio (ratio of actual to design or standard result) decreases as the complexity of design increases.

The cumulative effect on operating costs of complexity in design is surprising. Inventory and storage costs are higher due to the spares required, maintenance is higher, more operating, test and maintenance men are required, which means larger departments, more elaborate organizations and added burden on management. Plant layout should be very carefully considered as this determines the relative ease of operation. Cranes should be liberally used to facilitate maintenance. Soot blowers, valves, instruments, etc., should all be readily accessible and easily operated. Ample provision should be made for visible inspection of furnace operation. Suggestions on design should be sought from operators as much as possible. Refinements in design should only be carried to the extent that the financial return is sure and adequate to compensate for the effects of increase in complexity of design.

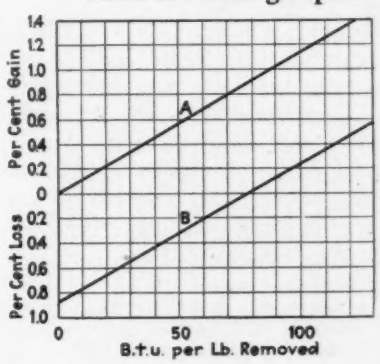
In a number of plants the last stages of bleed are not economical. Where there is no device to maintain constant superheat, irrespective of changes in feedwater

Operating costs decrease as turbine sizes increase



Approximate effect of size of single unit (or single section of compound units) on production costs exclusive of fuel. A study of production costs exclusive of fuel in a number of plants shows that for similar designs this annual cost varies mainly with the number of units.

Value of bleeding depends on heat removed



Influence of B.t.u. removed in turbine per pound of bled steam on per cent net gain or loss in fuel economy. Curve A is for plants in which the steam temperature can be made independent of changes in feedwater temperature and curve B is for the average plant without economizers in which there is a change of about 1 deg. F. in steam temperature for each 4 deg. F. change in feedwater temperature.

temperature, or where the superheat is not carried at the maximum for the materials used, those stages of bleed for which less than approximately 80 B.t.u. is removed in the turbine per pound of steam bled do not result in a gain in plant efficiency. For a given rate of boiler driving the superheat varies approximately inversely as the steam flow through the superheater. An increase of feedwater temperature means less heat to be added per pound of steam, thus a higher rate of evaporation and consequent faster steam flow. If less than 80 B.t.u. per pound is removed by useful work in the turbine the gain due to higher feedwater temperature is more than offset by an increase in water rate due to lower steam temperature. In addition, the stage or stages to which the above applies result in added complication, maintenance and fixed charges.* The second graph shows the net heat gain and loss in a plant without economizers for different points of extraction as indicated by the B.t.u. removed in the turbine per pound of bled steam.

In case the superheater is so designed that a maximum safe temperature is maintained at the average load and excess air, no decrease in feedwater temperatures can be made as this would increase the steam temperature beyond safe limits. Such design is not recommended, as a slight error in preliminary estimates may lead to a higher superheat than planned, necessitating some means of reducing this temperature, or, if the designed figure is attained, subsequent periods of operation are very probable in which some water heaters will be out of service or in which it will be desirable to run some boilers with increased excess air, either of which conditions will result in steam temperature above the desired safe limit.

Pulverized fuel firing

The firing method—type of boiler (with particular reference to first pass characteristics), furnace design and ash removal system—is generally fitted to the available coal supply, plant load factor and other local conditions. In further detail, the rate of coal burned per square foot of stoker area for stoker systems and the degree of burner turbulence in connection with the rate of furnace heat liberation for pulverized coal systems must be carefully fitted to the coal to be used. A design which gives good results in one locality often results in high costs in another location with different coal. Changes in design, such as increases in rates of furnace heat liberation, increase of air preheat, decrease of exit gas temperature, etc., beyond standard practice, should be developed gradually in connection with changes to the other related factors. Examples continually arise where this has not been done and frequent outages and high costs usually result.

If a wide range of coal quality is available and advantage is to be taken of spot markets, both dry ash and slag type pulverized coal-fired furnaces have given good results. One type has a large area of refractory walls, dry ash removal through a well-designed water screen (one through which flames do not travel) and low rate of furnace heat liberation. Dry ash removal is well suited to high ash-fusion-temperature coals and the combination of low-furnace heat liberation and properly designed ashpit water screen makes this furnace equally suitable to low ash-fusion-temperature coals. Water-cooled pulverized-coal-fired furnaces with dry ash removal and a liberal space between the lowest flames and the ashpit can handle a wide range of medium and high volatile coals. With less volume for ash cooling, only high ash-fusion-temperature coal should be used.

The molten slag removal method for pulverized-coal systems has solved the problem of burning low-grade coals in small furnaces at high rates of furnace heat liberation and low cost. This system has an upper limit of about 2,500 deg. F. ash-fusion temperature. Coals with higher ash-fusion temperature can be handled by mixing with low ash-fusion-temperature coal or by adding low ash-fusion material to the furnace. Complete furnace costs for the last two boilers of this type at the Toronto plant of the Ohio Edison Company for the first two years of operation was $115. Ash removal costs involve three to four man-hours per day per furnace.

The slag-tap system for pulverized-coal firing can handle nearly as wide a range in coal quality as the dry ash removal system described above. In a great many localities it is suitable for all the coal available, which is also usually the cheapest coal. The limits for this system are unusually high ash-fusion-temperature and low volatile content. Troubles with furnace bottoms have been largely obviated at the Toronto plant of the Ohio Edison Company by using mica schist or firestone and by not allowing the slag level to get either too low or too high. When either type of equipment is combined with an automatic control which regulates output and excess air this control can be so adjusted that the coal may change over wide limits without knowledge of the fireman or change in furnace temperature or efficiency.

Stoker firing

Although stokers have been greatly improved in recent years and can handle successfully very low-grade coals, a variation in supply affects stoker-fired plants more than some types of pulverized-coal-fired plants. This makes it possible for the latter to take advantage of spot markets. Nothing definite can be said as to the value of uniformity of coal supply as the loss in efficiency due to a change in coal supply varies from a minor amount to a large percentage, depending on the operating conditions.

Coking coals give poor results on all types of stokers. These coals can be burned with good results in pulverized form if the ash removal system, rate of furnace heat liberation and boiler first pass are designed for this coal, which is usually also of slagging type. Chain-grate stokers give best results with free-burning coals. Coking coals are greatly improved for use on these stokers, particularly the forced-draft type, by the addition of considerable moisture.

Underfeed stokers handling low ash-fusion-temperature coal should be designed for this condition, with particular regard to the rate of burning and the ash removal system, which should consist of a clinker grinder with water cooling for the larger sizes and at least a water-cooled bridge wall for the smaller sizes. High-grade coal of high ash-fusion temperature and low ash content is widely used on underfeed stoker installations

**For effect of feed temperature on steam temperature and economizer gain see "Steam Bleeding and Turbine Performance," by C. D. Zimmerman, in A.S.M.E. Transactions for 1925.*

and such good results have been obtained that it has been difficult to justify any other type of equipment where this coal is available. Uniformity of supply is of great importance for these installations.

To summarize: Operating, labor and maintenance costs are largely fixed by design and vary roughly with the number of single units and number of auxiliary pumps, heaters, etc., per unit. Simplicity results in appreciable savings and can be attained to a large extent regardless of heat cycle or changes in design. The costs increased by complexity of design are inventory, storage, superintendence, maintenance, management and labor. The limit of economical steam bleeding is generally 80 to 100 B.t.u. per pound of bled steam removed in the turbine. Where the coal supply is variable pulverized-fuel firing has given excellent results. Stoker firing is most economical when it is specifically designed for a definite type of coal and uniformity of coal supply can be maintained, although stokers in some cases have handled variable fuel supplies in very satisfactory fashion.

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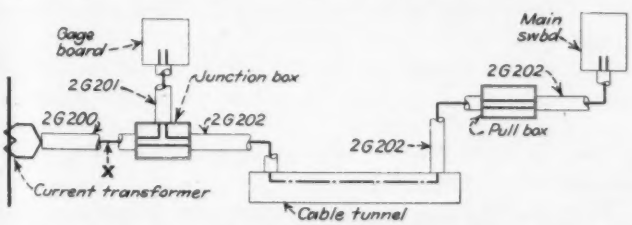
Numbering Conduit Systematically

By G. F. SARGENT and C. H. M. WHITE
Formerly Stone & Webster Engineering Corporation

Conduit concentration has reached a point in the modern power plant which calls for a change in the old methods of numbering. If possible the number tag should tell the complete story of the conduit's use without resorting to the conduit wire and schedule sheet. Number applications should be simplified by not changing the conduit number at pull boxes, but only at junction boxes where the actual number and size of wires in the continuing or branch run change. In this way it is possible to write the conduit and wire schedules before



Typical conduit run with numbers changing only at branching or tapping points

Formerly if a pull box were added at "X" all conduit numbers following 2G200 would have to be changed on drawings and in the field. With the through numbering system described here this additional pull box requires only a conduit plan revision.

conduit plans and elevations are drawn. If conduit numbers are stepped up after every pull box it is virtually impossible to write the schedules much ahead of drawing in, owing to the uncertainty as to the number and location of pull boxes.

Where conduit numbers are continued through pull boxes, manholes, cable tunnels and vaults, so long as the wire circuit is continuous, the advantage is realized of having conduit runs on similiar generators and other equipment identical regardless of run length. The newer system facilitates the use of typical wiring diagrams for similar apparatus by the addition of notations reading, for example: "Gen. No. 2 wiring similar to Gen. No. 1, except conduit number prefixes should read 2G21, 2E45, etc., instead of 1G21, 1G45, etc." Rapid identification can be aided by arbitrarily classified suffix numbers such as 1, 2 and 3 for generator main or field conduits; 100, 101, etc., for generator breaker and rheostat controls; 200, 201, etc., for current transformer conduits; 300, 301, etc., for potential transformer conduits, and so on. Excessive sub-classification of suffixes should be avoided, however. On any power plant job every one actively associated with the wiring or conduit work can soon tell, to illustrate the flexibility of the method, that 22PH112 conduit carries wires associated with 2,300-volt station service circuit No. 22, controlling a boiler feed pump motor; likewise, that 4E52 carries the main exciter No. 4 field rheostat control wires.

Sometimes it is difficult to tell where a general letter classification should stop, but usually a switchboard or terminal box is a desirable point for making the change. Thus, in a typical case, main exciter No. 1 armature leads are carried to the excitation switchboard in conduits 1E1 and 1E2, but from here to Gen. No. 1 field they continue in conduits 1G1 and 1G2, since the switchboard with its breakers is a good place to change from E to G. Endless changes are required in field and drafting room, where conduit numbers "seesaw" back and forth as pull boxes are added or withdrawn. Maximum efficiency in drafting and construction cannot be realized unless preliminary wiring diagrams, conduit and wiring schedules are completed ahead of the conduit plans.

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Battery Cadmium-Test Technique Improved

Some of the navy's submarine accidents have been attributed to faulty battery charging resulting from incorrect diagnosis based on the use of the cadmium-test electrode. This was disclosed in the paper by Captains Holmes and Elliott at the recent meeting of the American Electrochemical Society of Cleveland. It reports the recommendations for improved technique as a result of an investigation made by the navy with the co-operation of Professors Fink and Arendt of Columbia University.

The position of the cadmium-test electrode relative to the positive and negative plates and also the possibility of polarization phenomena affect the diagnosis of a cell's state of charge. Gradual rise in cadmium-to-negative potential is an index of battery depletion as a result of (1) acid weakening at the plate, (2) increased sulphation and (3) increased ohmic drop in the electrolyte. Polarization attends the draft of current by the voltmeter and some of the energy for actuating the voltmeter is supplied by oxidation of the cadmium metal to cadmium ions. This lowers the otherwise unpolarized emf. between the cadmium and the positive plate.

A hollow cone electrode is advocated for the purpose because it provides greater area and at the same time obviates another error disclosed by studies on a mesh electrode in which the horizontal members showed different potential from that of the verticals; circulation of the electrolyte accumulates more ions in the vicinity

of the horizontals than on the verticals where greater impoverishment of the solution takes place. The cone or the T-shaped electrode give play to both horizontal and vertical characteristics. Either should be placed in a fixed position out of the path of load current flow through the electrolyte.

Cadmium-to-plate potentials should be read to both plates and the differences should agree with the cell voltage to within 20 to 30 millivolts. The test is of greatest significance in determining the state of the battery if cadmium readings are taken at regular intervals throughout a discharge period and plotted against time. Single momentary readings are of little value in determining the cause of low capacity in individually troublesome cells or in deciding upon the economic advisability of overhaul. Cadmium readings should always be correlated with the readings of full cell voltage.

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READERS' FORUM

Flat-Rate Lighting in Low-Wage Urban Areas

To the Editor of the ELECTRICAL WORLD:

Completely electrified homes, or rather the homes which are most nearly completely electrified, are to be found in the cities and in the sections of cities whose inhabitants enjoy the highest average income. The amount of electrification per average home declines as the average wage of the area wherein the home is situated declines. But in surprisingly large areas household electricity is employed for little else than lighting, and in very surprisingly large areas, where the average wage is low, houses, flats and tenements are not served by electricity at all. Consideration of the last-named areas as markets for the sale of service is suggested.

But first it must be pointed out that existing practices of installation, metering, accounting, billing, of providing outlets for future appliances, etc., are practices evolved in supplying electricity to the highest wage areas. They are suitable for those areas and they are satisfactory to the dwellers within the high-wage areas.

But these practices are not particularly essential to the mere lighting of a house by electricity and where we encounter an area of such low wage that even the first step has not been made in the use of current, it would appear logical to abandon the practices of higher wage areas because these practices are precisely reasons why the cost of supplying a minute amount of electricity to each of a great number of customers is not profitable.

To fix ideas, suppose we imagine a system wherein current is taken first through a meter which serves a district of houses, thence through a locked fuse box in each house, thence through metal-sheathed wiring to locked lamp sockets equipped with 25-watt tungsten lamps.

While it is true that the use of appliances would be prevented, nevertheless we are considering customers who are not immediate prospects for appliances anyway. At least we would have established a type of service wherein a number of important economies could be effected.

The usual company overhead due to metering and billing would stop at the district meter. Beyond that point it would be possible to utilize cheap labor drawn from the district served, for repairs, replacement of lamps, collections on a flat-rate weekly prepayment basis, and for the prevention of unauthorized diversion of energy.

The plan is new as applied to urban areas. It is pioneering. Installation costs could only be estimated because the allowable exposure of surface wiring within the building would not be known; nor is it known whether the work of installation had best be paid for by the house owner or subsidized by the utility company.

Rates could be determined without great difficulty because the extent of the desire for electric lighting within the low-wage areas could be fairly well estimated. Actual costs of energy cannot, however, be computed with precision because the wastage due to flat-rate payment is not known. The locked sockets may be equipped with switches and the customer will turn off lights to save the lamps and to postpone the necessity of calling for the district representative, but the inhabitants of low-wage areas are not particularly provident, and wastage of light to some extent must be anticipated. Moreover, the hours during which lights would be burned are different than in other areas. They would, in general, be turned on earlier in the morning and turned off earlier at night. This would have a load factor advantage.

Clearly trial installation and study and service test and all the other concomitants of work in a new field are indicated. The only certainty is that it is possible to extend electric lighting into lower wage areas than those now served, particularly if the extension is made cautiously and the spread between rates and apparent cost is kept great enough to allow for unforeseen contingencies.

The system outlined is based on the use of equipment now available. It is unnecessary to await the development of new apparatus, a point in its favor, particularly at the present time, when immediate profits are of unusual importance.

Flat rate service, however, does not mean surcease from development labor. It opens up new fields.

There are perhaps possibilities in the development of transformers which would serve as current-limiting devices and permit the use of unguarded wiring. Possibly there are advantages in the way of cheap wiring to be gained by the employment of far lower voltages than 110 within a domicile. Radio equipment for use with the sort of service we are discussing would require certain deviations from present radio practice. And there are distinct additional incentives in increasing the accuracy of fusing, in devising accurate circuit-opening devices—where such equipment is found justified—and in ruling out the carbon lamp and the misrated and inaccurate tungsten lamp abominations to which the American market is being treated by foreign manufacturers.

W. A. RHODES

New York, N. Y.

BOOK REVIEWS

Temperature Measurement and Control

By M. F. Behar. Instruments Publishing Company, Pittsburgh, Pa. 420 pages, illustrated. Price, $2.

Constituting parts two and three of the Manual of Instrumentation, this book succeeds well in its aim of telling concisely the theoretical background, the actuating principles, the various details of design and the scope, with limitations, of instruments for measuring and for controlling both temperature and humidity. Covering as it does the range from abstract thermodynamics to the practical maintenance and testing of thermometers, pyrometers and hygrometers as well as the automatic control equipments actuated by them, it cannot fail to be of direct interest to combustion engineers, furnace engineers, metermen and those who are pioneering in the engineering of air conditioning. Often it surpasses the scope of manufacturers' literature and in general it goes far toward putting instrumentation on an independent plane as a tool for promoting efficiency and economy in processing activities. Tables are provided for thermocouple correction, psychrometrics, stem corrections, etc.

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Fünfundzwanzigste Berichtfolge des Kohlenstau bausschusses des Reichskohlenrates.

(25th Report of Committee on Pulverized Fuel)

By various authors. VDI-Verlag, Dorotheenstr. 40, Berlin NW 7. 62 large pages, 62 illustrations, 31 tables. Price 2 reichsmarks.

The committee on pulverized fuel of the German fuel commission has issued numerous reports, most of them reprints of scattered contributions to technical literature by prominent specialists. The present group, Report No. 25, deals with researches on pulverizers, tests on fineness of product and the suitableness of fuels for pulverizing. A list of earlier reports is appended.

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A Method of Lighting the Stage

By Stanley R. McCandless. Theatre Arts, Inc., New York. 132 pages, illustrated. Price, $1.50.

The title of this book under-rates its potentialities for the illumination engineer; its narrowness may be excused on account of the woeful lack of appreciation of architects and theatrical producers of the imperativeness of adequate lighting facilities to the success of dramatic productions. Out of his experimentation at Yale's Harkness Theater Professor McCandless has here really merged diagrammatics, stereotomy, optics, spectroscopy and illumination engineering into a conspiracy that bestows not only discerning visibility but, as well, tonal character, artistry and mood to the figures and setting of the stage.

Illumination engineering is moving rapidly out of mere technical efficiency into esthetic arenas. The show window is becoming the stage where the goods are the actors. The home, other social areas, and civic areas, too, are awaiting temperamental treatment. Technique on the dramatic stage leads the way for application to sterner realities. Just one glance at the moodiness of the mere cube in Fig. 9 will convince the prosy engineer that the severest kind of rigidity can have animation and temperament energized into it by the finesse of lighting.

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Financial Policies of Public Utility Holding Companies

By Merwin H. Waterman. Published by University of Michigan, School of Business Administration, Bureau of Business Research, Ann Arbor. 183 pages, illustrated. Price, $1.

More as probation officer than as prosecutor, judge or jury, Professor Waterman has dissected the financing and management records of five diverse but representative electric utility holding companies. North American is generally given laurels, while Associated Gas & Electric is politely castigated for almost everything it does. American Power & Light, Standard Gas & Electric, United Light & Power are given varying degrees of commendation or condemnation on different points.

The study is a searching one and by no means superficial. In the conclusions drawn there is a leaning toward condemning mere size and diversification without integration of holdings, preponderance of parent financing, calling of subsidiary bonds or non-voting preferred, special voting issues which separate control from investment and convertibility of bonds into stock. Favored practices are exchange of stock in new acquisitions, elimination of minority interests, open-end mortgages, debentures for parent companies, non-serial and non-sinking fund bonds of long term, use of stock dividends instead of cash dividends.

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Der Siemens-Konzern, 1932
Der AEG-Konzern, 1932

Published by R. & H. Hoppenstedt, Berlin SW 19. Prices, 3.50 and 1.80 reichsmarks.

These publications, of the series "Spezial-Archiv der Deutschen Wirtschaft," contain the sort of information given in the United States in financial reference works, but in greater detail. The first-named booklet, of 80 pages, gives detailed data on security issues, their market prices, affiliated and subsidiary corporations and other pertinent matter. Final figures are for the fiscal year 1931. A survey is included of the present state and future prospects of the German electrical industry. The other booklet, of sixteen pages, gives corresponding information on the Allgemeine Elektricitäts-Gesellschaft.

Two similar booklets relate to operating companies: B.K.L. (Berliner Kraft- und Licht-Aktiengesellschaft) 24 pages, price 2.20 reichsmarks, and Die Preussische Elektricitäts-A.-G., siteen pages, 1.80 reichsmarks.

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Induction Coil Theory and Applications

By Taylor Jones. Isaac Pitman & Sons, 2 West 45th Street, New York, N. Y. 242 pages, illustrated. Price, $3.75.

Treats theoretically of the induction coil as coupled oscillator, analyzing its behavior for optimum conditions in order to show practical applicability of the principles to the high-tension magneto and spark ignition. One chapter deals with the oscillation transformer fed by an oscillating triode instead of an interrupter. There is semi-extraneous subject matter on diffraction of electrons.

Men of the Industry

W. Drury New Chairman Wholesalers' Association

Walter Drury, who was recently elected chairman of the National Electrical Wholesalers' Association (ELECTRICAL WORLD, October 8, page 483), has to his credit a long career of service in the electrical industry. His first connection was with the Western Electric Company in 1904 and in the course of three years he became conversant with the important features of the switchboard, installation, telephone sales and equipment engineering departments at the Chicago and Hawthorne plants. Mr. Drury had an extensive knowledge of the mechanical side of the telephone industry when in 1910 he moved to St. Louis as telephone specialist. Two years later he was called to the general telephone sales department, and three months later he was again transferred to Dallas as sales manager. His progress from that point on became quite rapid. He was made manager of the Cleveland house in 1917 and two years later sales manager of the New York house. In 1923 he became eastern district manager for the company. When the Graybar Electric Company became an employee-owned concern Mr. Drury was named as a member of the board of directors.

Mr. Drury was president of the New York Electrical Association in 1925 and 1926 and has been chairman of the New York City Electrical Wholesalers for several years.

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G. A. MILLS, formerly chief engineer for the Central & South West Utilities Company and vice-president of the Pecos Valley Power & Light Company, Dallas, Tex., is now president of the Michigan Gas & Electric Company and the Michigan Public Service Company. As a result of his removal from the Southwest Mr. Mills resigned as a vice-president of the American Institute of Electrical Engineers representing that district. Following the completion of his technical education he became successively electrical engineer of the Waterloo, Cedar Falls & Northern Railway Company, electrical engineer of the Winnipeg Electric Railway Company, general superintendent of the Wisconsin division of the Northern States Power Company and vice-president and general manager of the Kewanee Public Service Company.

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WENDELL L. WILLKIE has been elected a director of the Commonwealth & Southern Corporation.

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DR. IRVING LANGMUIR, associate director of the research laboratory of the General Electric Company, Schenectady, has been awarded the Nobel prize in chemistry. One of the most distinguished scientists of the present era, Dr. Langmuir has made researches in many branches of science and has received many honors for his accomplishments. Early this year he was pronounced the winner of the *Popular Science Monthly* annual award of $10,000 for notable scientific achievement (ELECTRICAL WORLD, March 5, 1932, page 465).

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OBITUARY

GEORGE BAILY, assistant sales manager of the merchandising department of the Westinghouse Electric & Manufacturing Company, died, of a cerebral hemorrhage, October 29 while attending the Pitt-Notre Dame football game in Pittsburgh. Mr. Baily was engaged in the construction business in Pittsburgh before moving to Cincinnati, where he entered the employ of the Westinghouse Electric & Manufacturing Company, in its Cincinnati sales office. He remained there until 1917. After serving in the World War he rejoined Westinghouse in Cincinnati. Later he was sent to Pittsburgh, then to New York and subsequently to the Pacific Coast. Then he returned East, making his headquarters in Mansfield, Ohio.

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J. SCOTT BUTTON, in charge of the architectural engineering service bureau of the General Electric Company, died, of pneumonia, at Schenectady November 3 following several weeks of illness. He entered the employ of the company in 1896 in the drafting department, after attending Cornell University. Subsequently he served in the direct-current engineering department, the lighting commercial department, in 1919 was placed in charge of sales to educational institutions and municipalities and in 1925 was transferred to the industrial commercial department to take charge of the architectural engineering service bureau. He was first vice-president of the Producers' Council, associated with the American Institute of Architects, and a member of its executive committee; was a member of the commercial and industrial lighting committee of the National Electric Light Association, a member of the welding committee of the American Institute of Steel Construction and was active in the work of other architectural organizations.

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E. N. Sanderson

Edwin N. Sanderson, one of the leading developers and operators of public utilities in the United States, president of the Federal Light & Traction Company for twenty years and a member of the firm of Sanderson & Porter, died November 9 in the New York Hospital at the age of 69. For more than 30 years Mr. Sanderson had been identified with public utility and industrial enterprises. A native New Yorker, he received the degree of civil engineer from the Rensselaer Polytechnic Institute in 1866 and the next year that of master of engineering from Cornell University. He spent nine years with the Westinghouse Electric & Manufacturing Company in East Pittsburgh as engineer, in New York as engineer and salesman and in Boston as manager of that office.

It was in 1896 that he and H. Hobart Porter established the consulting engineering organization that bears their names. As president of the Federal Light & Traction Company he was also at the head of its 30 subsidiary operating utilities, supplying electric light, power, railroad, gas, water and ice service in the United States and Canada.

Mr. Sanderson was a life member of the American Institute of Electrical Engineers.